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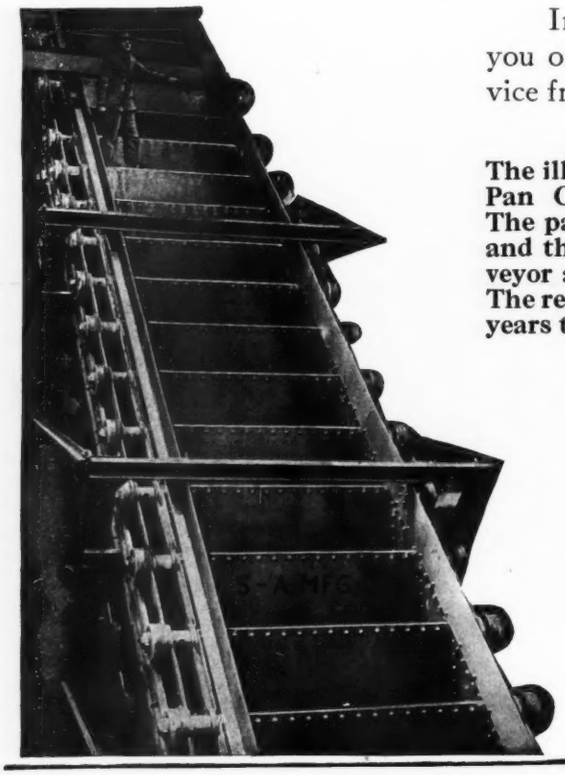

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Engineering and Mining Journal

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Driving Operations of the Spiro Tunnel of the Silver King Consolidated

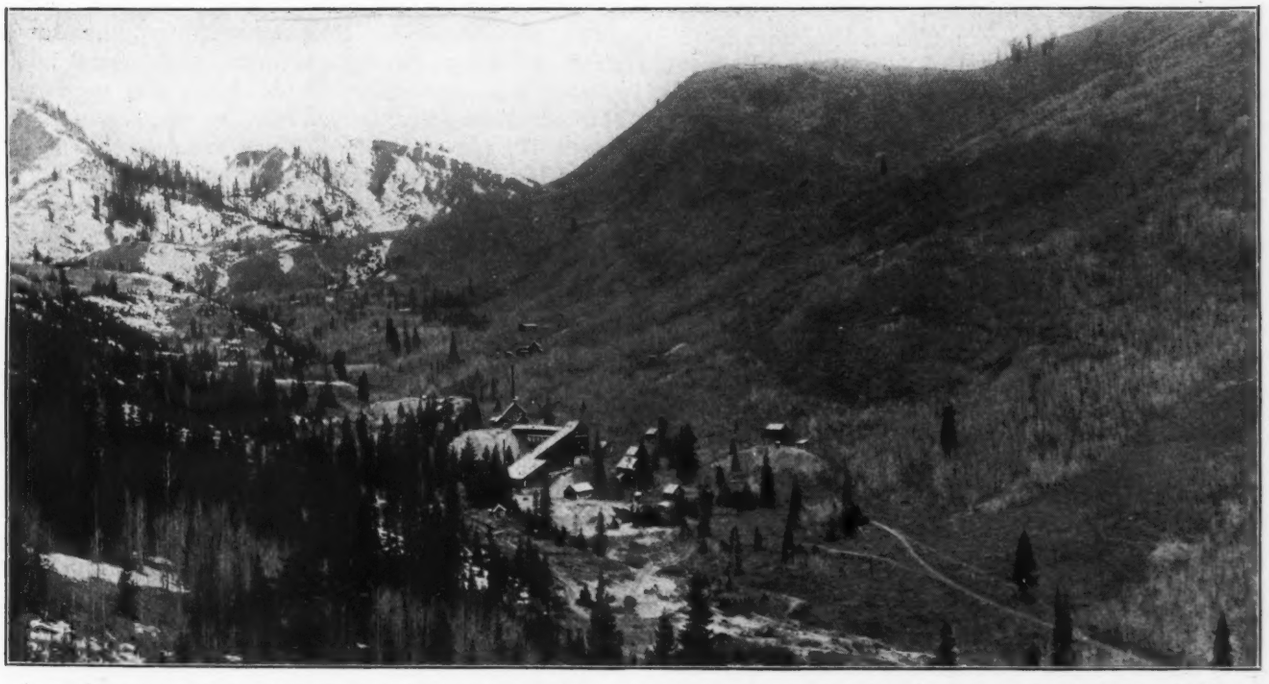
BY MURRAY SCHICK*

A 14,000-ft. tunnel is being driven for drainage and development purposes, of which 4000 ft. has been completed at a cost of $25 per ft., including equipment. Individual machine drills have been provided for each machineman, thereby reducing repair costs per drill shift. Two and three shifts per day have been worked and an average of 308 ft. per month of timbered double-tracked tunnel has been driven.

THE Silver King Consolidated Mining Co. is driving a 14,000-ft. drainage and development tunnel at its property in Thayne's Canyon, near Park City, Utah. By September of this year 4000 ft. had been finished. The work was planned and directed by the engineering staff of the company and the bore is known as the Spiro tunnel.

Early mining operations in Thayne's Canyon, while productive of considerable good ore, were confined to the upper limestone known as "Thayne's formation," and did not extend below to the Woodside shale or the lower Park City formation. The shaft of the Silver King Consolidated was sunk to a depth of 950 ft. through the Thayne limestone, the shale and into the Park City limestone, which has proved to be mineralized under Thayne's Canyon as in the territory further east. Although the shaft was high up on a monocline dipping to the northwest, it made considerable water while sinking. The shale seemed to form an impervious stratum that held all underground water of surface origin and a deep shaft through the lower portion of the monocline was thereby rendered impracticable.

The Silver King Consolidated holdings comprise about 1000 acres, covering the entire length of the canyon. The starting point of the tunnel is 6888 ft. above sea level, the lowest elevation to be found in the vicinity, and to gain that level it was necessary to drive several thousand feet through the limestone and shale formations.



THE CALIFORNIA-COMSTOCK MILL AT THE HEAD OF THAYNE'S CANYON, PARK CITY, UTAH, WHERE THE SPIRO TUNNEL WILL TERMINATE

Clearing and grading for roads, houses and tunnel portal commenced in May, 1916. Building started the

*Room 305, Boston Bldg., Salt Lake City, Utah.

month following. A substantial blacksmith and machine shop was constructed, covered with corrugated iron. Work started in the tunnel in June. In July a plugger drill was used for drilling part of the time and during the latter part of August the regular drills were placed in service, the delay being caused by the scarcity of drill steel. A compressed-air line was extended from the mine to the tunnel, a distance of nearly two miles, and was laid on top of the ground with the necessary anchors and slip joints. At the tunnel the air passes through a receiver, 20 in. by 30 ft., under which a slow fire is maintained. This gives dry air to the machine drills, raises the temperature and promotes efficiency.

Individual Drills for Each Machineman

An individual drill was purchased for each machineman and an extra machine kept in reserve. Each machineman was required to use his own machine and no other and was held responsible for its condition. The machines were taken outside after each shift and thoroughly tested, cleaned and oiled. A record is kept of all repairs charged against each drill and a substantial reduction in repair cost as compared to the repair cost of drills used by all shifts has been made. A record of the amount of drilling by each machine, explosives used and cars of rock removed is also kept.

The size of the tunnel in the clear is 7 ft. 4 in. wide at the bottom, 6 ft. at the top and 7 ft. high. Mine cars have 20 cu.ft. capacity. A double track is used. The main track and switches have 30-lb. rails, 18-in. gage, laid upon 6 x 10-in. sills spaced at 5-ft. centers. The daily extension of the track and dump switches is made with 12-lb. rail. On the monthly change day there is no power but this time is utilized in extending the main track, air, water and ventilating pipe lines.

On the left side of the tunnel a water ditch, 3 x 4 ft., is carried below the tunnel floor. The grade is 0.3% and the course S 28° 40′ W. The tunnel has passed through several breaks and slips in the formations, with fractures filled wholly or in part with vein matter. These veins cut through the formation on nearly a vertical plane and have approximate strikes varying from east-west to north-south. At 4000 ft. the breast of the tunnel has a depth of about 800 ft. vertically below the surface. Ventilation at present is obtained by means of a suction fan operated by motor and drawing the air from near the breast through an 18-in. steel pipe exhausting at the portal. The motor is driven from a power line, which also supplies current for lighting.

Close timbering was seldom required through the Thayne limestone through which the tunnel passed for the first 2700 ft. In the Woodside shale stretches of loose and swelling ground occurred which retarded progress considerably.

Two 8-hour shifts are worked constantly and three shifts have been put into service when labor and material were available. The average rate of progress for the first 400 ft. was about 308 ft. per month.

The Spiro tunnel has had to contend with rising costs, scarcity of material and diminishing labor efficiency; nevertheless construction expense has been kept within peace-time estimates. Expenditures, including preliminary building and equipment, aggregate $98,000, or slightly over $25 per ft. of tunnel.

The tunnel survey is entirely in territory owned or controlled by the Silver King Consolidated and can be extended 1000 ft. more within the company's domain. At 14,000 ft. the tunnel level will be approximately 1800 ft. below the surface. The portal is only a few hundred yards from the Park City branch of the Denver & Rio Grande R.R. and within less than a mile of the Silver King Consolidated mill.

Hydraulic-Filling Method To Extinguish Fires in Butte Mines

Butte Correspondence

A method for extinguishing fires in Butte mines has been decided upon by the engineers of the Anaconda Copper Mining Co. after a study made of methods applied in mines all over the world. Hydraulic filling is to be used and is expected to extinguish not only present fires but also to prevent such fires in the future.

The Leonard mine will be the first of the Anaconda mines to adopt the method and preparations have already been made to install it on the various levels of this and other mines of the company. The plan adopted incidentally solves another problem that threatens to become rather serious, due to lack of dumping ground in the cramped quarters of the district. The filling material to be used will come from the present and future sand tailings of the Butte & Superior company's mill which at the present rate of production are piling up in such quantities that the available room and facilities for disposal have been nearly exhausted. The flume that brings the tailings more than a mile to the Leonard mine is already built and will be connected to the 10-in. pipe placed for that purpose down the Range shaft, as soon as the piping on the underground levels can be laid. At intervals the sands will be forced through diamond-drill holes into the fire region. The water will seep to the bottom and eventually be drawn off, after being clarified by methods the details of which are now being worked out. The fine sands will be forced by the static pressure into existing cavities in the fire zone and eventually shut off all fresh air and oxygen from the fire. The hydraulic filling will be placed on the lower fire levels first and gradually will work to the top.

As a means for preventing fires in the future, the Anaconda company has made a most successful start by fireproofing the shaft of its Tramway mine, which was the scene of a destructive conflagration some time ago. The entire 2475 ft. of this shaft has been made safe against a repetition of such a scene by covering all timbers in the shaft and stations with a ½-in. coating of cement which was made to adhere to the timbers by surrounding them with steel lathing. A few feet above and below each station the timbering was removed and replaced by solid concrete walls built against the surrounding rock. The method will be introduced with all possible speed in all of the company's shafts as well as in drifts and crosscuts especially exposed to danger. Fireproofing of the shaft was accomplished in 94 days.

Exportation of Scrap Copper, lead, zinc, iron and alloys thereof from Chile may be prohibited by the President of that country if national interests so demand, a law of Sept. 21, 1917, having given him this authority.

Utilization of Low-Grade Manganese Deposits a Metallurgical Problem*

The development of low-grade manganese deposits in America at such cost as may be necessary is regarded as a war necessity by J. E. Johnson, Jr., who holds that the consumption of ferromanganese should be limited to the manufacture of low-carbon steels. Silicon-alloy substitutions for deoxidizing steels, the production of a manganese pig iron from extensive low-grade manganiferous iron ores, and the difficulties of wet concentration are problems to be worked out by the metallurgist.

THE war has brought about a situation in regard to several minerals which is unprecedented. America has been liberally endowed by nature with most of those minerals required for the purposes of civilization, among the first of which are coal and iron ore; but in regard to others, quantitatively less important, but still vital to this country's progress, she has not been so generous. Hitherto this has made little difference, cheap and unrestricted navigation to and from all parts of the world having supplied America with those thing of which her own yield was scanty or wanting; but with a blockade existing in a large part of the world, with a huge proportion of the world's total ship tonnage sunk and most of the rest commandeered by the governments for war purposes, the supply of vessels for commercial work has become almost a vanishing quantity. In some cases it is not a matter of price but of a lack of bottoms at any price.

Gross Ton of Steel Requires 17 lb. of Manganese

Some minerals which could be imported more cheaply than they could be produced can no longer be obtained abroad except at prohibitive prices and our own supplies must now be developed, be the cost what it may. In regard to those minerals of which this country has no supply of her own, the situation is exceedingly serious.

Manganese is one of the minerals with which nature has been niggardly in her supply to America, and it has hitherto been imported, either as ore or as ferromanganese. This country's need arises from the fact that about 17 lb. of manganese, or roughly 0.75%, is required per gross ton of steel to deoxidize the steel and make it a useful product. Manufacturers are not using any more manganese per ton of steel now than formerly—rather less—but the total consumption tends to rise because of the unprecedented output of the steel industry under present conditions.

There have been in the past three principal sources of supply which are in fact the principal manganese-producing districts of the world. (1) The Caucasus Mountains of southern Russia, where there is perhaps the world's largest supply of this indispensable mineral; (2) India; (3) Brazil. This is the order of importance of the districts from a tonnage point of view in the pre-war period, though Brazil was a bad third, producing roughly only about 250,000 tons as against nearly 1,000,000 tons for the Caucasus. The Russian deposits are cut off from America entirely by the closing of the Dardanelles. The Indian fields are at so great a distance that the freight under present conditions has become absolutely prohibitive. Of the three principal fields, therefore, only the Brazilian remains available.

For several years practically no manganese had been produced in the United States. Present conditions caused renewed activity in mining this mineral, but according to the Geological Survey, the total supply of manganiferous materials in this country is considerable, although much of it is low grade. Domestic ores could supply a large part of our needs if we made our metallurgy fit the conditions.

Two Standard Alloys, Spiegeleisen and Ferromanganese

The metallurgical side of this situation is extremely important. There has been in the past only two varieties of manganese alloy in common use—spiegeleisen, containing about 20% manganese, 5% carbon and the rest iron, and ferromanganese of standard variety, containing 80% manganese, about 6% carbon and the rest iron. In the days when the bessemer process was the only one of any importance for producing steel and when rails were the principal steel product made, the use of "spiegel" was almost universal. It was melted in cupolas and tapped as required into a ladle which was charged with the required amount for a heat, taken to the converter and poured into the bath after the completion of the blow. The ratio of carbon to manganese is about 1:4 in spiegel, whereas it is about 1:14 in "ferro." This means that 1% of manganese imparted to the steel with spiegel would raise the carbon 25 points (0.25%), whereas if imparted by ferro it would raise the carbon only about seven points (0.07%). Assuming the carbon to be blown down to 0.08 in both cases, the total carbon with 1% manganese would be 0.33 in one case and 0.15 in the other. For example, 0.33% carbon is much less than is required for rails, and the remainder of the recarbonization was accomplished by adding straight pig iron.

When the openhearth furnace came in, all this was changed. The openhearth brought about the application of steel to a multitude of purposes for which wrought iron had been used in the past, and the steel, to be suitable for these purposes, must be low in carbon. For a vast proportion of the total output, exclusive of rails, the 0.33 carbon is entirely too high. This situation brought about the use of ferromanganese, and, once introduced, its use grew. On account of its small volume, it could be charged direct into the furnace or the steel ladle, and all the bother of handling another ladle of molten material was eliminated. As rails have become a decreasing percentage of our steel output, the importance of the low-carbon steels has grown greater and greater, and in the period immediately before the

*Excerpts from a paper, "The Situation in Regard to Manganese, Sulphur, Pyrite and Some Other War Minerals," read by J. E. Johnson, Jr., before the Engineers' Society of Western Pennsylvania, Nov. 27, 1917.

war there was no sale for spiegeleisen. The New Jersey Zinc Co. had stacked up more than 30,000 tons of spiegel, which was virtually unsalable under the conditions then prevailing. The material was a byproduct and the situation was a serious one for the producer. Within a few months, the present conditions in the steel industry began to develop, and this huge accumulation was sold at a price much higher than that which the company would have been glad indeed to take a few months earlier.

Iron, Phosphorus and Silicon Detrimental to Manganese Ores

High-grade manganese ores being necessary to produce ferro, numerous enormous deposits of low-grade materials have remained undeveloped. If more than a certain limited percentage of iron, roughly one-sixth of the amount of manganese, be present, standard 80% ferro cannot be produced. Spiegel, as already shown, is normally almost unsalable. Not alone the presence of iron ruins manganese ores, but phosphorus and silica as well. Phosphorus becomes increasingly important as the content of manganese is lower because the amount of alloy to be added obviously increases as the percentage of manganese in it decreases, and a phosphorus content which might be tolerable in a 50% manganese ore may be prohibitive in a 25% ore. Silica is objectionable because of the loss of manganese that it involves.

Manganese is much more active chemically than iron. It is easily possible to run an iron blast furnace so as to keep the iron content of the slag down to 0.2% or under, but with manganese this is not the case. Each unit of silica carries away with it in the slag a proportion of manganese, this proportion depending roughly on the amount of other bases in the slag and on the temperature at which the furnace is run. If the temperature is high, the reduction of manganese is more complete than if it is low, but an attempt to make a complete recovery by raising the temperature indefinitely is not practicable, since another difficulty is encountered by so doing. Manganese is volatile, is driven off as a vapor in the hearth and passes out with the gases in a huge yellow cloud which can be seen coming out of the boiler stack at most ferromanganese furnaces. The cinder, on the other hand, always has a strong yellowish green tint, characteristic of manganiferous slags. It was formerly thought that of the total manganese charged, one-third was lost, but practice in this respect has been greatly bettered in recent years. One of the best furnacemen in the country claims to be running with a loss of 15 per cent.

Returning now to the ores, it has been customary to penalize all silica in excess of 12% for the reasons just given. The recoverable manganese in the ore is smaller as the silica rises. This condition has made worthless the low-manganese ores, even when they were approximately free from iron, because manganese could not be produced from them without a loss that was commercially prohibitive. To summarize there is, then, the following situation: (1) A small tonnage of high-grade ore in the United States. (2) A considerable tonnage of low-grade manganiferous material not suitable for ferromanufacture because of either too much iron, too much silica, or too much phosphorus, or a combination of all three. (3) A demand for a manganese alloy with a low ratio of carbon to manganese, so that low-carbon steels can be produced containing enough manganese to deoxidize them thoroughly. (4) The requirement that an ore to produce the desired alloy must be pure.

In the face of the present scarcity of ships, which has already limited severely imports of rich manganese ore and which threatens to limit it still further, what is to be done? The answer is not to be found in a sentence, but only by applying these rigid conditions to each problem and working out the best solution on its merits. The solutions broadly are to be found along three lines. (1) The absolute conservation of ferromanganese for steels, the requirements of which rigidly demand that they be low in carbon. (2) Breaking down metallurgical prejudice in favor of the exclusive use of high-grade ferro and using 70, 60, 50, 40 and 30% alloys for those purposes in which the carbon and manganese requirements of the product permit their utilization. This is a matter of psychology as much as of practice. The inertia of the steel men, which naturally prejudices them in favor of the practice to which they are accustomed, must be overcome. They must get out of the rut and learn to do something different, not only because it may be cheaper, but because the safety of the country as a whole and the outcome of the war depend upon the production of steel. (3) The specifications for steel should be rigidly revised by all steel manufacturers and steel users, perhaps under the auspices of the American Society for Testing Materials, so as to lower the manganese content in all cases where the absolute necessities of the case do not require it to be as high as at present. Some of the best steel makers are convinced that the present specifications for manganese in many classes of material are higher than they need to be, and it is possible that in the manufacture of steel manganese, like charity, may cover a multitude of sins. Steel well made can have its manganese content distinctly lowered and still be better than a badly made steel doused with a parting hypodermic of manganese to make it stagger through the tests.

Metallurgical Changes To Promote Economy

A fourth point involves changes in the metallurgy of manganese itself. The electric furnace has been used for several years in Europe in the production of ferro, and its application to this purpose has made a good start in the United States. It has distinct advantages over the blast furnace under present conditions, for the price of the product is so high that the balance in favor of coke as against electric power for its production no longer controls. The electric furnace has the great advantage that it uses little fuel in comparison with the blast furnace and therefore does not have to contend with anything like the silica, which comes from that source in the blast furnace and takes its toll of manganese when it goes out as slag. Further than this, part of the silica, a considerable part, can be reduced and combined with the manganese to form a ferrosilicon manganese, which has a distinct advantage. It prevents the loss of manganese which accompanies the silica when the latter is slagged, and, what is even more important, it forces down the carbon. In ferro containing 10 or 15% of silicon the carbon has been found to be only about two instead of 6%. This means that the carbon-manganese ratio in such a material is far

lower than in straight ferro, even though its content of manganese be materially lower than that of the standard alloy, and offers possibilities which have not yet been fully realized. It is possible to use a mixture of spiegel, or low-grade ferro, with this silico-ferro, so as to obtain the required amount of manganese without permitting the carbon to rise above the desired percentage. A representative of an electric-furnace plant recently made the claim that by melting the ferromanganese before charging, a saving of about 20% in the amount required could be made. This is the statement of an interested party, but there seems to be good reasons for believing that at least some improvement could be made in this way, and, if so, there is no excuse under present conditions for not making it.

Difficulties in Beneficiation of Manganese Ores

A natural question to ask is why the lower-grade ores of manganese cannot be treated like other low-grade ores and brought up to standard metallurgical grade by washing, jigging or some other process. The answer to this question is twofold. (1) The cheapness of the imported ores until recently made such a course commercially unprofitable. (2) The nature of the manganese minerals themselves. Manganese seems to have the faculty of diffusing itself through gangue material in a condition of almost impalpable fineness, and while in many cases there is no chemical union between the two, the problem of separating them by any of the accepted methods of ore treatment has so far failed absolutely. Of course when lumpy manganese is associated with clay, the latter can be washed out, or if it is mixed with particles of rock, these can be jigged out, but there is a great deal of material containing 20 to 30% manganese and about 25% silica with a considerable amount of alumina. This material has a consistency about like that of stove polish, and no method of ore treatment so far developed has sufficed for the apparently easy task of separating this simple mechanical mixture. Experiments are under way at present looking to a solution of this problem along radically novel lines, but the investigation is as yet incomplete and is entirely unprotected by patents. Those interested are hopeful that within a few months low-grade material now worthless can be converted into extremely high-grade ferro, but it is obviously inadvisable to give further details at this time.

Silicon-Alloy Substitutes for Deoxidizing Steel

Various substitutes for manganese have been proposed. Many years ago Henry D. Hibbard tried deoxidizing a heat of steel with ferrosilicon. He killed the heat absolutely; it poured like cream, but when the ingot went through the rolls it broke up into pieces more like birdshot than billets. In other words, in spite of its higher heat of combustion, silicon has not the deoxidizing power of manganese in steel. It has been found that about 25% of the work of deoxidation could be done by silicon, but that the remainder had to be done by ferro. In the electric furnace, it is contended, this condition does not exist and a heat can be so thoroughly killed and deoxidized that good steel can be made without the addition of manganese. It is doubtful, however, if prejudice would permit an acceptance of such steel without a much longer time of trial than has been available under present conditions. It has been proposed that use be made of other metalloids or particularly combinations of these, such as calcium-silicon or calcium-silicon-aluminum in such proportions that their oxides after they had been converted to oxide in deoxidizing the bath would form a fluid slag and so free themselves from the steel in the same way that the oxide in manganese does. This is said to have been done extensively in Europe, but the practice has not been developed to any important extent in this country.

Production of a High-Manganese Pig Iron from Manganiferous Iron Ores

One of the most hopeful methods of bettering conditions is by so altering American practice as to leave the manganese in rather than to introduce it at the end of the process. While ores high enough in manganese to be considered as ores of that element are scarce, there are available enormous tonnages of manganiferous iron ore, and some of even the extremely lean-grade manganiferous material can be charged into the furnace to produce a high-manganese pig iron without causing excessive expense by increasing the slag volume. Then by starting steel manufacture with an iron containing more than 1% manganese, preferably 2%, an important amount can be left in the bath at the conclusion of the oxidizing operation, which is the essence of steel making. This manganese has two good effects: (1) By its presence it tends to prevent excessive oxidation of the heat. (2) It replaces at least a part of the manganese which must otherwise come from the scarce high-grade alloys. Somewhat similar results can be obtained by adding enough manganese ore to the slag to make it decidedly manganiferous. According to such information as is at present available by this means there occurs a considerable reduction of the manganese oxide to metallic manganese by the metalloids of the bath and the manganese content of the iron rises as the heat progresses. The information is not sufficient to permit figures as to the relative consumption of manganese by this process and by the other, but it is reasonable to assume that the efficiency of the manganese would be higher if charged into the blast furnace and almost completely reduced there than if charged into the openhearth and reduced only to a fractional extent.

The situation in regard to manganese is acute and it is a patriotic duty and a commercial necessity to conserve the supply by every possible means. A meeting of the metallurgists of all the steel plants of the country under instruction from the executives of their respective companies to thrash out all these matters to the bottom, each one to have instructions from his chief not to strive for a partisan advantage, but as a matter of patriotic duty to lay all the cards on the table and give to all the experience and knowledge of each for the benefit of the country as a whole, would promise the solution to the situation.

High Prices Necessary To Develop Manganese Resources

The thing for the steel men of this country to hope for is that the price of manganese will go higher. The shipping situation is so serious that ships are almost certain to be taken out of the manganese trade, and that will cut off a corresponding percentage of the present supply of manganese ore. It is positively known that managanese resources in this country are suffi-

cient to last for two or three years if intelligently handled, but they will do no good unless they are developed, and they will not be developed unless it can be done at a profit to someone. The Government bureaus have been urged with the utmost emphasis to consider the absolute indispensability of a pronouncement from the highest authority in Washington that the price of manganese ore would not be regulated downward during the period of the war, and it has been pointed out that if, pursuant to this policy, the price of manganese should rise, as it probably will, the steel makers should be allowed a compensating increase in the prices fixed for their product. The bureaus of the Government are, it is believed, favorable to this idea, and if influence be brought along this line, much may be accomplished, but if the short-sighted view of holding down the price of manganese by price regulation be adopted, the steel industry as a whole and the country with it are likely to suffer. Manganese at $500 a ton is much better than manganese at a nominal price of $100 when it cannot be obtained at any figure.

Zinc Ore Prices in Joplin Nominal and Market Not Representative

Although the basis price for zinc ore in the week ended Nov. 24 ranged between $52.50 and $72.50, with an "average" basis price of $62.50, in reality the settlement price did not exceed $56.71 for at least 66% of the production from 75% of the largest mines in the Joplin district—Missouri-Kansas-Oklahoma—according to figures compiled by the Associated Zinc Ore Producers and printed in the *Joplin News-Herald* of Nov. 25, 1917. The statement issued by the association specified that a basis price of $60 for 60% ore was offered for 11½% of the production and that $65.85 a ton was the average price bid for 16% of the zinc ore produced. Those figures not only are for the week named, but for ore produced since Nov. 10. The entire statement follows:

It was reported yesterday that there was practically no change in the price of zinc ore this week from the price which prevailed the week previous, when the basis range was from $57.50 to $72.50 per ton for 60% zinc blende in carload lots. Also that Friday, as for several weeks past, only a comparatively small tonnage was purchased at the top basis price, the greater portion of the sales being made around $65, and that this week's average settlement will likely be around the same figure.

During the past 48 hours this office has received accurate and reliable information regarding prices offered for ore from 87 companies operating 133 mills in various parts of the district, which is not in harmony with the figures above quoted.

Only two operators producing 400 tons a week report being offered as high as a $72.50 basis at any time since Nov. 10, and one of these is a property owned by a company also engaged in the smelting business, while the other operator who was offered this price has a production of but 40 tons per week. Twelve companies, with an aggregate weekly production of 927 tons, were offered various prices from $62.50 to $70 per ton, the average of all offerings being $65.85 a ton.

Fourteen operators having a weekly production aggregating 681 tons have received bids of a $60 basis, while 37 companies having an aggregate output of 3897 tons per week were bid from $52.50 to $57.50 per ton, the average price offered being $56.71 per ton.

The foregoing figures, representing nearly 6000 tons weekly production, may fairly be taken as an average for the entire district, and from these figures it is shown that but $56.71 has been offered for 66% of the zinc ore produced; that but $60 a ton has been offered for 11½% of the production and that $65.85 is the average price that has been bid for only 16% of the zinc ore produced since Nov. 10. To make the actual situation more clearly understood let it be known that the figures here quoted are over the signatures of operators themselves, on cards now filed in this office, which show that since Nov. 10 the best bids that have been made for 77½% of the ore produced have been at or under $60 per ton.

The "average price," which is a much misused term, cannot be ascertained by merely taking the high price which may be paid for a few tons of ore and the low price which is paid for a large amount of ore and dividing the difference between the two prices; but can be ascertained with accuracy only by knowing all the bids that have been made for all the ore, which is the basis upon which the foregoing information has been tabulated.

It was declared also by an officer of the Associated Zinc Ore Producers that the many reports of overproduction of ore in the tri-state district were a myth. "It has been said there was as much as 60,000 tons of ore lying in the bins of mines in the Joplin district," said the officer. "On the other hand, the surplus doesn't begin to reach those figures. Indeed, the situation is becoming so complex that mines are still closing down. Several producers in the West Joplin field ceased operation last week, leaving but two mines operating there."

Data returned to the association showed that there were 7076 men employed at 87 mining companies' properties from which replies were received. The car shortage is proving an overwhelming barrier in the district, in that railroads are able to furnish but a small proportion of the cars needed in moving the weekly production. This is not causing the ore to pile up, but is bringing about a curtailment and shutdowns.

Standardized Crushing on Marquette Range, Michigan

MARQUETTE CORRESPONDENCE

The Cleveland-Cliffs Iron Co. has standardized another ore-producing operation on the Marquette range, namely crushing. All lump ore requiring crushing before shipment, as well as incoming lump coal, is sent to a central crushing plant situated at the Maas mine. The plant was completed in July and has been operating on coal and ore continuously since. The Maas plant crushes the Jackson ore (Negaunee), Holmes lump (Ishpeming) and Lake lump (Ishpeming). A similar plant is in operation in the Gwinn district, crushing all the company's lump ore in that district.

The ore is brought to the plant in 45-ton, quick-dumping, standard railroad cars and spotted above a receiving bin on a slight grade. As needed, a car is dropped down to the bin, dumped and run down to the loading pocket, where it receives the same ore it brought to the crusher. The receiving bin is of concrete, steel lined, with nearly vertical sides. The bin holds one car of ore and discharges automatically upon a pan conveyor, with 7½-ft. pans having a capacity of approximately one car of ore. The conveyor discharges upon a 3-in. grizzly over which the oversize slides to a No. 7½ McCully gyratory crusher. The crusher product and the grizzly undersize fall upon a long inclined, 36-in., troughed belt conveyor which discharges into a framed-timber loading pocket, beside the track, 200 ft. below the lump-ore pocket.

The pan conveyor is driven by a 50-hp. motor, the crusher, by a 100-hp. motor and the belt conveyor by 50-hp. motor. The average monthly output is 30,000 tons of run-of-mine ore, reduced to three inch.

Mining Men in National Service

LIEUT. M. ROBERT GUGGENHEIM
Machine Gun Co., 165th U. S. Infantry, 42d Division, A. E. F.

LIEUT. HARRY F. GUGGENHEIM
With U. S. Naval Aviation Forces in France

CAPT. ERLE P. DUDLEY
20th Regiment, U. S. Engineers, Washington, D. C.

CAPT. JOHN G. WORTH
Commanding Auxiliary Remount Depot, Macon, Ga.

Cyaniding a Small Gold-Tailings Dump

By A. W. ALLEN*

An account of the erection and operation of a small leaching plant. This is usually a "one-man" proposition, and the notes published are mainly for the benefit of the non-technical operator whose only chance of success lies in economy in construction and simplicity in method.

TAILINGS dumps are found wherever gold is mined. They often carry appreciable amounts of the precious metal, but operations on a company scale are seldom justified on account of small tonnage and low possible yield. Opportunities for the small operator are numerous, but he is often handicapped by scarcity of capital and lack of technical experience. Avoidance of unnecessary equipment and simplification of operations will materially increase his prospect of success.

The general arrangement of the simplest type of plant for the purpose is shown in Fig. 1. The leaching vats suggested are 15 ft. in diameter, 4 ft. deep, and made of galvanized iron. The bottom pieces should be of No. 20 and the side pieces of No. 22 or 24 gage. The accompanying tables of data relating to galvanized sheet iron, plain and corrugated, have been prepared to aid in the selection of construction material. A stiffening ring around the top of each vat is optional. The sheets should be double-riveted and soldered inside and out. On the outside and bottom they should be painted with tar, and on the inside with P. & B. cyanide paint. Galvanized iron is practically indispensable for constructing small plants of this description.

A platform of lumber may be used if finances permit; otherwise a carefully leveled bottom, with sand spreading, is usually adopted. Care should be taken to see that the vats are absolutely water-tight when finished. As soon as this is demonstrated, the spaces between them and against one side may be filled in with earth or tailings to carry a track to facilitate filling. On the opposite side a track for discharging may run on a level with the bottom of the vats. An overhead track above the vats for filling purposes is not justified by the size of the plant.

Use of Storage Sump Avoids Frequent Pumping

The capacity of these vats will be about 25 tons of dry tailings. The plant calls for three sumps of twice this volume. One of these, placed above the level of the leaching vats for storage of solution, will be found especially useful. It will obviate the necessity for frequent pumping and enable continuous leaching to be carried on during the night without personal attention. A separate service of 1½-in. piping is connected with the bottom of each leaching vat by double flanges, and delivers to a distributor (see Fig. 3) placed above the level of the zinc boxes. Each pipe is fitted with a piece of canvas hose and a cast-iron plug cock as shown. The distributor has three compartments through which delivery may be made to No. 2 sump, or No. 1 zinc box, or to No. 2 zinc box; and the discharge from any of the leaching vats may be diverted into any one of these compartments.

To avoid the cost of filter bottoms, the leaching vats may be arranged as shown in Fig. 2. The upward filling of the vat with strong solution is made possible by the use of a piece of 3-in. piping, flanged and perforated near the bottom, standing at the side of the vat and close to the solution-supply pipe. The filter bottom consists of pebbles, gravel, and sand, in the order named,—a combination which has often proved thoroughly satisfactory as a cheap filtering medium. The top layer of sand may be renewed occasionally when there is a tendency toward delay in leaching.

The arrangement of piping around the sump is shown in the general arrangement plan. If only a centrifugal pump is available it should preferably be placed on a

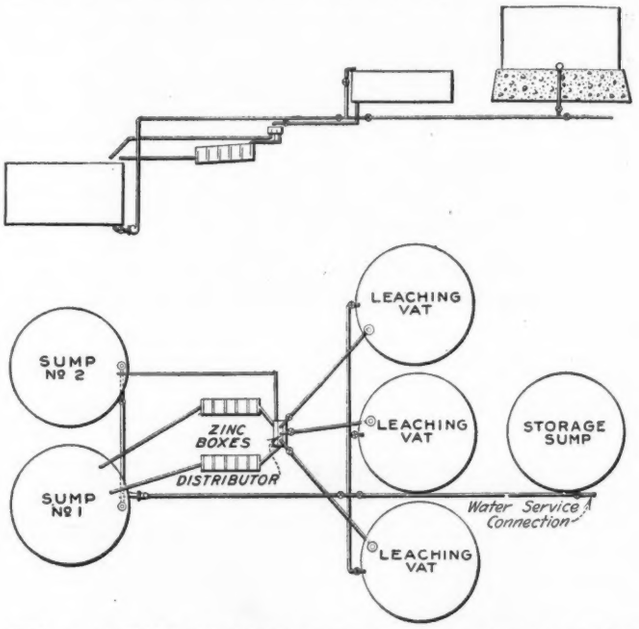


FIG. 1. LAYOUT OF SIMPLEST TYPE OF LEACHING PLANT

level with the bottom of the sumps, so that it will be always under a head of water. Much priming trouble will thus be avoided. If a plunger pump is used it can be placed above the sumps. A 2-in. pump and service will be found sufficient.

Disadvantages of Discharging Leaching Solution from Several Vats Through One Pipe

An idea of pipe economy sometimes prompts operators to connect all the discharge pipes of the leaching vats underneath the vats with a single solution main leading to the extractor house. Or, as an alternative, two mains are sometimes used, each vat having a separate valve connection with each main. Both systems are to be avoided. The principal disadvantages are: (*a*) Valves are needed underneath the vats and at points usually difficult of access, where it is equally impossible to see the discharge or effectively to regulate the leaching rate; (*b*) the piping and valves are exposed, thus increasing the danger of freezing and bursting in winter; (*c*) there is a danger of the loss of valuable solution

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by the inadvertent connection of two vats, one of which is discharging, or the passage of rich solution from a vat with a fresh charge to one in which treatment is almost concluded, leading often to an inexplicable rise in residue value; (*d*) there is no easy method of sampling the effluent of any particular vat; nor is it always possible to discharge it directly to the sump, or to hasten percolation in case rapid drainage is desired. In more than one instance I have come across plants so equipped and constant trouble and difficulty have resulted. The arrangement suggested as an alternative, and now usually adopted, is far preferable and will result in more efficient operation.

Details of Zinc-Box Construction

The zinc boxes needed can be made cheaply of 20-gage flat galvanized iron, riveted, soldered and painted with P. & B. paint, and may be mounted on wooden trestles. A convenient size for small leaching plants, such as the type under description, is made of two 3 x 7-ft. sheets, which, when riveted together along their lengths, form the sides and bottom of the box. One inch should be allowed for overlap. The end pieces are 25 x 25 in., with a square inch cut from each corner. On three sides the extra inch is bent at right angles for riveting to the body of the box. The surplus on the top side, in

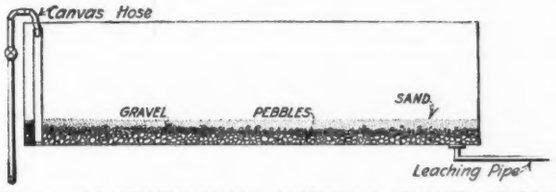


FIG. 2. LEACHING TANK, SHOWING FILTER BOTTOM

conjunction with the extra inch at the sides of the box, is for covering a stiffening ring made of $\frac{3}{8}$-in. round iron. The box, when completed, is therefore 7 ft. long by 23 in. wide by 23 in. deep.

Four division plates are cut 20 in. deep and 25 in. wide. These are bent for an inch on each side at right angles, and the first plate is then riveted in place 3 in. from the head end of the box and 1 in. from the top. These plates then alternate with others, to be described later, and carry a piece of 1-in. angle iron riveted along the bottom, the bottom edge of the angle being flush with the bottom of the plate. The projection comes inside the compartment and is for the purpose of supporting the screen or screen frame. No division plate should be placed flush with the top of the box as there is then no provision against chokage in any particular compartment, and overflow is likely to result. The secondary division plates are riveted to the bottom as well as to the sides of the box and are placed 18 in. from the other plates and 2 in. below the top level of the box. The sheets are therefore cut 25 x 25 in., with a square inch taken from the two lower corners, and the sheet bent for an inch on the sides and bottom. These plates also carry a strip of 1 x 1-in. angle iron 3 in. from the bottom to support the other side of the screen frame. A channel space of 2 in. is left between each compartment. Riveting of the division plates to the body of the box is all done inside the compartments and not in the space between the compartments. When completed every joint and every rivet should be soldered and tested before being painted. Leakage from one compartment to another is almost as great a detriment as leakage from the box.

Screens Should Be Easily Removable

Four-mesh iron-wire screening is a convenient size to use, although a finer mesh is preferable in the first compartment, where there is usually more fine zinc. If heavy screening is obtainable there is no need of a screen frame, but two bent iron handles should be fixed to the screen to allow its easy removal. These handles need only come a few inches above the screen and should not be carried above the surface of the solution, as the latter plan often leads to short-circuiting.

There are four compartments in each box and three boxes are generally necessary. These will have a total zinc-shaving capacity of about 18 cu.ft. each. The boxes are conveniently supported on 3 in. x 2 in. wood trestles in the manner shown in Fig. 4. These are bolted to the box in the channel between the compartments at the middle, and also at the ends of the box.

STANDARD GAGE NUMBERS AND DIMENSIONS OF GALVANIZED PLAIN-IRON SHEETS *

Standard Gage No.	Thickness In.	Standard Widths	Standard Lengths
10	0.141	24 in.	72 in.
12	0.109	26 in.	84 in.
14	0.078	28 in.	96 in.
16	0.062	30 in.	120 in.
18	0.050	36 in.	1.83 m.
20	0.0375	61 cm.	2.13 m.
22	0.0312	66 cm.	2.44 m.
24	0.0250	71 cm.	3.05 m.
26	0.0188	91 cm.	.....
27	0.0172	.....	.....
28	0.0156	.....	.....
29	0.0141	.....	.....
30	0.0125	.....	.....

* Standard widths and lengths are made in all thicknesses mentioned.

GAGE NUMBERS, DIMENSIONS, NUMBER OF CORRUGATIONS, ETC., OF GALVANIZED CORRUGATED-IRON SHEETS

Thickness In.	Gage No.	Corrugations 3-Inch	Number of Sheets per Ton of 2240 Lb. Lengths 6 ft.	7 ft.	8 ft.	9 ft.	10 ft.
0.05	18	8	72	62	54	48	43
		10	62	53	46	41	37
0.0375	20	8	85	81	71	63	57
		10	79	68	59	53	47
0.0322	22	8	116	99	87	77	69
		10	97	83	73	65	58
0.0250	24	8	140	120	105	93	84
		10	117	100	88	78	40
0.0188	26	8	186	159	139	124	111
		10	155	133	116	103	93
0.0172	27	8	193	165	144	128	115
		10	161	138	120	107	96
0.0156	28	8	200	172	150	133	120
		10	167	143	125	111	100
0.0141	29	8	220	189	165	146	132
0.0125	30	8	240	206	180	160	144

Precipitate discharge arrangements may be provided by means of cast-iron plug cocks connected by short nipples to bored and threaded squares of $\frac{3}{16}$-in. iron plate, which in turn are attached to the bottom of each compartment by means of galvanized-iron roofing bolts. Plates and bolts are then soldered to the bottom of the box. If larger boxes are required, much thicker iron must be used to ensure rigidity and prevent bulging of the sides and division plates and channeling of the solution.

Slime in Dump Must Be Dried and Broken Up

Seams of slime in the dump must be exposed and thoroughly dried. All slime must then be broken up and intimately mixed with the sand so that no lumps of any appreciable size are allowed to go to the leaching vats. The best way to insure this is to screen the material roughly and pass it through a set of hard-wood rolls. These can be operated by a small gasoline engine, the initial cost of which will soon be repaid in improved

extraction results. A mixture containing up to 50% of slime may thus be treated in a shallow vat and uniform percolation insured.

As soon as the vat is filled with tailings the leaching-pipe cock at the distributor in the extractor house should be closed. Then solution is pumped from the sump through the hose into a wire tray containing the cyanide and into the top of the pipe (with the perforated lower end) standing in the vat. This allows it to percolate upward and evenly through the charge without channeling. It is usually advisable to leave the solution in contact with the ore overnight. In the morning the canvas hose, connected at the distributor with the leaching pipe from this vat, should be put into the distributor compartment, which is connected directly with No. 2 sump. The cock is then opened cautiously and the solution allowed to run directly to the sump until it is clear of slime. A few minutes generally suffices. The hose is then placed in the distributor compartment leading to one of the zinc boxes and the solution passed slowly through the zinc. When the level of the solution in the leaching vat sinks below the top of the sand, it is advisable to pump more solution directly on the charge; or, if found advantageous to extraction, the vat may be allowed to drain partly before the next charge.

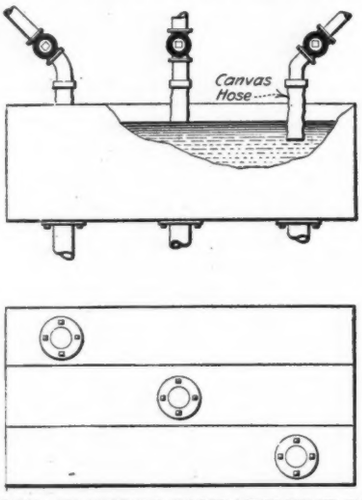


FIG. 3. SKETCH OF THREE-COMPARTMENT DISTRIBUTOR

Operations of Leaching Cycle

On the basis of three days for treatment, the preferable method of leaching is as follows:

First night—Soaking with strong solution made up from sump No. 2. No leaching.
First day—Leaching with solution from No. 2 sump.
Second day—Leaching with solution from No. 1 sump.
Third day—Leaching with solution from No. 1 sump.
Third night—Drain.
Fourth day—Discharge.

A water wash may be added late on the third day. The water service may be conveniently connected to the cyanide main beyond the storage sump, and should be arranged so that no back-flow is possible.

The treatment of dried tailings offers unusual advantages in the matter of water-washing without involving an undesirable accumulation of low-grade solution. The ground ore enters the plant at probably 8 to 10% moisture and leaves at from 18 to 25%, according to the percentage of slime present. The evaporation from large areas of vat surface is also considerable in most places. The result is that there is ample scope for washing with water. Normal water-washes are, however, usually inefficient and, unless large quantities are used and much time is spent, it is common to find an appreciable amount of cyanide associated with the residue. Provided final leaching has been carried out with barren solution, this fact is not without an advantage, for the loss of cyanide is accompanied by a loss of dissolved zinc, which, if allowed to accumulate in the solution, would result in sundry complications involving the need of a continuously increasing cyanide strength in the circuit to maintain effective precipitation, with correspondingly high zinc and cyanide consumption.

Modifications in the matter of solution destination may be necessary to keep the balance. The point to be remembered is that final washes should be as free as possible from contained gold and should consist of precipitated solution or water. The effluents from the leaching vats may be distributed as follows to insure maximum efficiency and minimum precipitation cost:

First day—Run solution through zinc boxes.
First half of second day—Run solution through zinc boxes.
Second half of second day—Run solution direct to sump No. 2.
Third day—Run solution direct to sump No. 2.
Third night—Run solution direct to sump No. 2.

Uniform Solution Best for Precipitation

Solution from leaching vats should be mixed to produce a uniform grade. There is seldom advantage in keeping strong and weak solutions separate and running them to different zinc boxes, although the practice may be followed in exceptional cases. In most instances the adoption of the single-solution idea has resulted in large economies in cyanide consumption, with no variation in extraction. If a solution is so strong that cyanide is in excess of precipitation requirements, the inevitable result of segregating the solutions will be an unnecessary consumption of zinc and a loss of cyanide. If the operator has any doubt as to the solubility of zinc in strong solution, let him watch the effect of a small lump of cyanide placed on the shavings in a zinc box filled with solution.

If a solution is too weak for effective precipitation it should not be run through the box. By combining all the leaching-vat effluents a solution can be obtained of uniform cyanide strength, the actual percentage present being controlled by the amount of the salt added to each fresh charge. With a dump material of fairly uniform composition it is usually feasible to restrict cyanide addition entirely to the fresh charge. The aim should be to produce a precipitated solution that is as nearly barren as possible; otherwise dissolved gold losses in the residue will be unnecessarily high. In the attainment of this end it will be found that uniformity in the matter of cyanide content is the chief desideratum.

Chemical Control of Operations

It is assumed that preliminary small-scale tests have demonstrated the practicability of cyanidation under normal conditions, and that no especial precautions need be taken in practice. Lime is generally necessary and cyanide, of course, essential. It is usually advisable at first to mix about 40 lb. of slaked lime with the contents of the vat by adding a small amount to each car of tailings. The first solution is allowed to dissolve about 40 lb. of sodium cyanide gradually as it enters the leaching vat. This amount will probably be necessary for each of the first three charges, after which the quantity may be reduced to 18 lb., or less, per charge.

Solution testing, even if carried out in a rough way, is valuable in the control of operations, and the following system of obtaining an estimate of the principal constituents of the solution in circuit is recommended. The reagents used are made as follows:

Silver-nitrate solution—Dissolve 6.5 grams of pure silver nitrate ($AgNO_3$) in 1000 c.c. of distilled water, and keep in a stoppered bottle covered with opaque paper.

Iodide indicator solution—Dissolve 4 grams of caustic soda (NaOH) and 1 gram of potassium iodide (KI) in 100 c.c. of distilled water.

Acid solution—Dissolve 1.123 grams of crystallized oxalic acid ($C_2H_2O_4$, $2H_2O$) in 1000 c.c. of distilled water.

Ferrocyanide solution—Make up a 10% solution of potassium ferrocyanide ($K_4FeC_6N_6$) with distilled water.

Phenolphthalein indicator—Dissolve 1 gram of phenolphthalein in 25 c.c. of alcohol and add 25 c.c. of distilled water.

Cyanide check solution—Dissolve 2 grams of potassium cyanide (KCN) in 1000 c.c. of distilled water.

Alkali check solution—Dissolve 2 grams of potassium hydrate (KOH) in 1000 c.c. of distilled water.

All the reagents must be chemically pure. The cyanide and caustic solutions are for checking the results whenever there is doubt about the strength of the standard solutions or the correctness of the factors. The cyanide solution must be freshly prepared, as it decomposes. Titrating flasks may be kept clean and free from deposit by washing in acidified water, followed by rinsing in distilled water. Float indicators are a help in reading burettes, which should be covered with a loose cap of lead foil to exclude dust where stoppered burettes are not available.

Testing for Cyanide and Alkali

To test for cyanide, filter the solution from the sumps if it is not clear. Take 50 c.c. of this and add 5 c.c. of the iodide-indicator solution. Use a narrow-neck titrating flask. Then run the silver-nitrate solution slowly and cautiously from a burette until a yellow coloration persists after shaking and standing for a while. Find out how many cubic centimeters of the silver-nitrate solution have been taken, and multiply by 0.01. This will give what is termed the "total cyanide percentage in terms of potassium cyanide." The latter is generally taken as the unit in such estimations.

It is impossible to be dogmatic about the strength of solution necessary or advisable, but as a general rule in small leaching plants the total cyanide percentage content is kept between 0.05 and 0.10 (1 to 2 lb. per ton). If the stock solution circulating through the plant drops below the minimum, more cyanide may be added to the next fresh charge. If it rises above the maximum, less cyanide is probably required.

To test for alkali (lime, etc.), take another 50 c.c. of the filtered solution, add 5 c.c. of the ferrocyanide solution, and then a little more silver-nitrate solution than was found necessary in the total cyanide test. Then add a few drops of phenolphthalein indicator, taking care that it does not touch the sides of the beaker, the hands, or anything but the solution. The latter should turn crimson or pink. Next run in the acid solution slowly from the burette, with occasional shakings of the beaker, until the color disappears. Read off the number of cubic centimeters used and multiply by 0.002, which will give the "percentage protective alkalinity in terms of caustic potash" (which is taken as a convenient standard).

If the solution does not turn pink or becomes only slightly so when the indicator is added, more lime must be used in the plant. As with the cyanide, it is inadvisable to dogmatize without knowledge of conditions, but it may be taken as a rule that when the protective alkalinity of the sump solutions rises above 0.05% (1 lb. per ton of solution), in terms of caustic potash, the amount of lime added to the tailings should be reduced.

Consumption of Lime, Cyanide and Zinc

The quantity of lime required varies widely. Sometimes none is necessary and in other cases 10 to 15 lb. per ton of tailings is required. In the latter event a preliminary wash with a weak solution or water to dissolve the lime and neutralize the acid may prove advantageous. On a clean oxidized ore which has previously been milled in alkaline water and contains little or no partly decomposed pyrite the cyanide consumption should be low. If the solution is protected with sufficient alkali, the amount used will vary upward from ½ lb. of cyanide per ton of tailings. The solvent used is generally sodium cyanide, which contains about 30% more available cyanogen than the potassium salt and is therefore often referred to as "130% cyanide." Copper, of course, will cause a marked increase in cyanide consumption if the metal is present in soluble form. Zinc consumption will depend largely on the care taken to use a solution of the minimum alkali and cyanide strength consistent with satisfactory extraction and precipitation. The amount required is also influenced by the method of dressing the zinc boxes and the avoidance of an unnecessary production of "short" zinc, which has to be destroyed at clean-up times. In small plants a consumption of 1 lb. of zinc shavings per ton of tailings treated is normal, but even this amount is largely in excess of theoretical estimates. The reason for the loss is that the solutions are generally low grade and often contain only a minute percentage of metal to be precipitated. The zinc is always in continual contact with other solvents, such as cyanide and caustic alkali, and this accounts for the bulk of the loss. It is therefore advisable to keep the grade of the solution going to the boxes as high as possible, which may be achieved by slow percolation and by precipitating only the richest solutions coming from the vats. There is no material disadvantage in returning solutions containing gold, as the previous milling of the ore in alkaline water has usually left the tailings in a clean condition for the cyaniding operation.

Troubles Experienced in Extracting

When the residue assays are not as low as might reasonably be expected, it is advisable to investigate. The next residue sample should be divided in two. One part should be assayed directly after drying and the other half should be thoroughly washed with water, and the water decanted off after settlement, before being dried and assayed. If the washed sample gives an appreciably lower result than the unwashed one, the amount of gold in the residue may probably be reduced by increasing the amount of water used for final displacement or by

improving the precipitation in the zinc boxes to decrease if possible the amount of gold in the tails solutions. The extraction may be further investigated by grading the sample through screens of different mesh and assaying the resulting products. Reasons for low extraction may often be deduced from the results. High assays of the coarser sizes may indicate that the ore has not been ground finely enough for satisfactory leaching or that the time of contact with the percolating solution has been too short. High assays in the slime may indicate poor mixing of it with the sand before charging into the vat. Faulty extraction may be detected by sampling the residue of the vat *in situ* before discharge, the samples to represent horizontal sections of the charge. Assays of these may reveal higher gold content in the bottom layers than at the top of the charge. I remember one instance in which the bottom quarter of the charge assayed higher than the original sample, and this after an extensive leaching treatment. Such variations are often due to re-precipitation of the gold and usually occur only where high-grade material is being handled. Sometimes they may be due to the inefficient displacement of dissolved gold by barren solution or wash. Slow percolation rate with high moisture percentage in the residue after drainage indicates an excess of slime. A properly proportioned mixture should leach at the rate of from 1 to 1½ in. per hour.

Complex compounds often form beneath the filter bottom. Solution with matter in suspension should be run directly to the sump and returned to the top of the charge until a clear effluent is obtained. This phenomenon seldom occurs after regular leaching has begun. "White precipitate" is a name given to a deposit often found on the zinc, particularly when semi-oxidized pyrites forms a proportion of the material being cyanided. Sometimes the deposit causes no particular trouble and does not adversely affect precipitation results, but in other instances active steps must be taken to reduce the amount. The usual method of doing this is to raise the free cyanide content in the solution by means of a drip of strong cyanide at the head of the zinc box.

Method of Avoiding Poor Precipitation

Bad precipitation is frequently caused by paying too little attention to the boxes or by poor packing of the zinc. In either case it results in channeling of the solution, which can easily be detected by adding a few drops of phenolphthalein to the solution entering the compartment under suspicion, and seeing whether the coloration spreads evenly through the mass of zinc. The appearance of hydrogen bubbles is a usual sign, though not an invariable indication, that precipitation is going on satisfactorily. The action is largely electrical and is sometimes stimulated to advantage by bringing some dissimilar metal into contact with the zinc. Lead is generally used for this purpose in the form of a saturated solution of lead acetate into which the shavings are dipped before being packed in the zinc box. The lead-coated zinc is then placed preferably in shallow horizontal layers, in the compartments, alternating with layers of ordinary zinc. Improved precipitation often results, but the method has the disadvantage, in addition to that of first cost, that the lead ultimately finds its way into the bullion unless special refining methods are adopted.

The final phase, constituting a monthly or semi-monthly operation, is usually the bugbear of the process and is always greeted with mixed feelings—pleasure at the prospect of a return and disgust at the labor and worry involved. This is often due to lack of experience in the intricacies of the process and to the impossibility of installing the facilities and conveniences adopted in normal-scale operations. In order to reduce cleanup troubles as much as possible, start early in the month by paying careful attention to the dressing of the zinc boxes, so that, when cleanup time comes, the gold will be associated with the minimum amount of zinc. In dressing the boxes it is always advisable to move up the partly plated zinc from compartment to compartment and never to put fresh zinc at the head of the box. If there is a tendency toward choking in the first compartment, followed by channeling of the solution, dress more frequently and reduce the depth of shavings. By

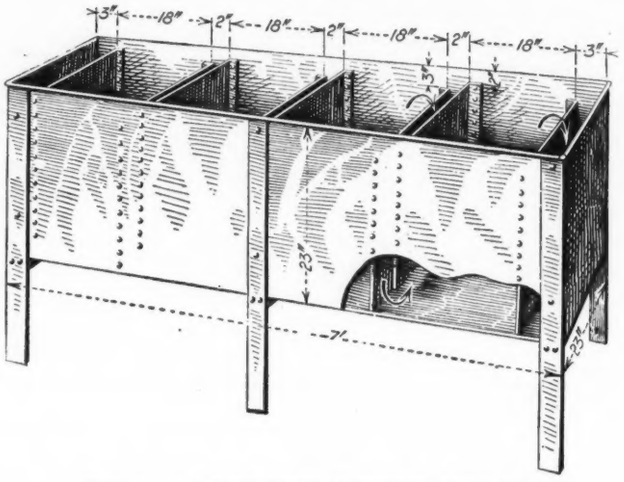


FIG. 4. A FOUR-COMPARTMENT ZINC BOX

adding fresh zinc to the head of the box the final grade of precipitate is invariably lowered. Every effort should be made to take advantage of the solvent-precipitant action of the incoming solution, which is at a maximum at first contact with the zinc shavings.

Separating Zinc from Sludge

Two methods are available for the removal of the zinc from the sludge in small plants. In one the zinc is roasted, after having been wetted with a brine of niter, and the mixture of gold, zinc oxide, and other impurities, is smelted. The method is fairly efficient, although losses are unavoidable, but these may be reduced far more than is generally supposed. The greatest disadvantage is in the large amount of low-grade precipitate formed, all of which has to be smelted after admixture with a considerable proportion of expensive flux. The smelting operation in small plants is one in which labor should be reduced to a minimum, and acid treatment of the zinc sludge should therefore be practiced wherever possible. Too much emphasis cannot be laid on the advice that this operation, if attempted, should be carried out thoroughly. Plenty of hot water should be used, and acid and hot water should be added, with continuous stirring, until there is positively no further action.

Where the silver content of the ore is negligible, and also where copper is present, it is often advisable to

follow the sulphuric-acid treatment by an additional treatment with nitric acid. In one instance within my recollection the plant was so far removed from civilization that it did not pay to ship even silver. Moreover, the cost and labor of smelting were so great that it was found an economy of money and energy to reduce the zinc-box product with double-acid treatment, so that the dried material had the appearance of retorted gold, and was smelted with the minimum of trouble and with only a little borax as flux.

Smelting precipitate requires much experience, coupled with a fairly extensive theoretical knowledge of the process. Where large amounts of low-grade material are being smelted by inexperienced operators, the results obtained are often disappointing. In small plants every effort should be made to reduce the product to be smelted to as clean and concentrated a form as possible and to place little reliance on the effectiveness of refining in the crucible. This fact is not generally realized in the experimental stages of operations, and sometimes not until the appearance of the bar of bullion, whose dwarfed dimensions suggest the immediate resmelting of the slag in an endeavor to find the missing metal. Clean precipitate means clean bullion and no dispute over the assays. Production of base bullion inevitably leads to conflicting assay results in which the small operator has no hope of holding his own. Small parcels of precipitate can easily be treated to carry from 70 to 80% of bullion, and the slag from the smelting of this is so small in amount and should be so clean that retreatment will not be necessary and one of the most frequent causes of loss thus obviated.

Sampling and the Calculation of Extraction

Sampling in a small leaching plant is a phase of operations which is often neglected, to the detriment of progressive results. Heads samples should be taken from the cars going to the vats by means of a tubular galvanized iron sampler about 4 ft. long and 1.5 in. in diameter, and with a ¾-in. slit from the point to within 6 in. of the end forming the handle, something after the fashion of a cheese taster. This is driven diagonally into the tailings, twisted to smooth the bore hole, and removed. A separate sampler should be kept for the residues (tailings after leaching) and the receptacles used should be distinctly marked to prevent accidental interchange. The samples obtained should be thoroughly mixed and reduced in bulk before final drying for assay. The residue dump should also be sampled around the tipping face at intervals of a week or more and the result used to check the assays of the samples taken from the cars. The facility for checking and rechecking the gold content in the residue is a factor which makes this computation of greater reliability than the head assay and favors what is generally known as the "bullion plus tailings" method of calculating the actual recovery. In this case the assay of the head sample is not considered and actual recovery percentage is calculated as follows: B equals fine gold in bullion in oz.; R equals fine gold in oz. in residue from which the bullion was recovered. Then $\frac{100[(B + R) - R]}{B + R}$ equals actual discovery[1].

Keeping Accurate Records Necessary

No plant is so small that the keeping of records is not imperatively necessary, for by such means only is it possible to increase efficient working and obtain the best results. Tonnage figures should be based on a definite decision as to intervals and should preferably refer to the actual tailings charged to the vats during the period. It is impossible absolutely to reconcile yield with theoretical estimates in a leaching plant, but the method of calculating tonnage should be inflexible. The record book should show the numbers of the vats, when they were filled and discharged, their assay value before and after treatment, and other useful data. From these figures may be estimated the total tonnage handled in the period and the average assay of charge and residue, from which an estimate can be made of the extraction according to the assay or theoretical figures. For various reasons this will not agree with the actual results for the first month's operation, but subsequent comparisons will form a basis for an intelligent control of the operations. It will be invaluable for estimating the probable yield at any particular date and will invariably indicate where improvements in the process can be effected. In Fig. 5, a type of ruling for this purpose is shown.

Irregularities between practice and theory usually adjust themselves as the work proceeds, and an excess in one month over theoretical estimates should be followed by a corresponding discrepancy in the returns of

TREATMENT BOOK

Date Filled	Vat No.	Charge No.	Date Discharged	Depth Filled	Tons	Assay		Assay Extraction		Theoretical Amount of Gold Extracted, Oz.	Sump Solution Tests		Remarks
						Charge	Residue	Per Ton	Per Cent.		Cyanide	Alkali	
Totals and Summaries for the Month													

Cleanup.....19....

.....Oz. bullion assaying.....fine in gold and containing .....fine ounces for which was received $.....

Total costs and expenses.....

Net Profit for the Month.....$.....

FIG. 5. SPECIMEN PAGE OF TREATMENT BOOK, SHOWING EFFICIENT WAY OF KEEPING RECORD OF OPERATIONS

[1]This could be more simply expressed by $\frac{100\,B}{B + R}$. It is, of course, based on the assumption of honesty of employees and that the total gold as calculated, or B + R, is equal to the gold actually present in the heads.—Editor.]

the month following. Such variations are usually explainable by the assays and should occur only where considerable variation in value is encountered in the tailings from day to day. A discrepancy in yield is naturally more common than an excess over theoretical estimates. Assaying and sampling are often responsible. Old gold dumps from an amalgamation process usually contain amalgam, and this makes the accurate sampling and assaying a difficult matter. Overheating the sample before the assay is also a frequent cause of erroneous result. Granted correct assaying and estimation of tonnage, a discrepancy may be caused if the method of sampling favors the inclusion of an excess of a part of the product having different physical properties and a higher gold content than the remainder. Seams of high-grade slime often cause trouble in this respect, and the best way to check the result is to screen both charge and residue sample to determine whether the percentage of slime is the same in each case. Solution leaks and drips around the plant often appear unimportant but seldom fail to swell the loss discovered at the end of the month.

Effect of Copper in the Solution

The majority of copper ores are affected by cyanide solutions, and gold ore entirely free from copper is the exception rather than the rule. Small amounts, often only a minute fraction of 1% are sufficient to increase the cyanide consumption; and even though the metal may not be detected in the ore, its presence in the solution is very quickly demonstrated by the immediate plating of the zinc shavings with a copper coating. There is no method of excluding the copper, if in soluble form, and dissolving only the gold by cyanide. Once in the solution it should not be allowed to accumulate, as this tends to lower the efficiency of the solvent with reference to the gold. Copper may easily be precipitated from solutions of low cyanide strength, and the copper-plated zinc will then serve to precipitate the gold, although not so effectively as with clean zinc. As long as the cyanide consumption is not excessive, or above the economic limit set by the grade of the tailings and the necessary operating expenses, there is usually no marked trouble to be expected in cyaniding ore having a small amount of copper; and it is customary to obtain an undiminished extraction of the gold when copper is present and is being dissolved and precipitated in the zinc boxes with the gold.

Extraction of Gold and Silver

Silver occurs almost invariably in combination with gold. In most cases the amount is insufficient to warrant special consideration in treating a gold tailings dump. Cyanide leaching of silver ore is impracticable if efficient extraction is the aim as the silver occurs in comparatively large masses and usually as a somewhat refractory sulphide. Hence, in treating gold-silver tailings, a high extraction of the gold may be obtained by leaching, together with a poor extraction of the silver. Further expense in improving the latter is usually inhibited by the low value of the metal under consideration. Extraction of silver is usually not taken into account in theoretical estimates of progress unless the metal occurs in sufficient quantity to make the operation pay. If silver does occur to an extent warranting recovery, the question of efficient treatment by an alternative process involving fine grinding or sliming should be considered. When tailings carry only a few dollars' worth of silver per ton, an extraction of from 50 to 60% is all that may usually be expected when leaching 20-mesh material. If the gold occurs free and the ore has already been efficiently amalgamated, a much higher extraction of the more valuable metal can be obtained by the simple leaching methods outlined. Actual percentage of extraction will, of course, depend on the amount of gold in the tailings—the richer the tailings the higher the percentage of recovery. For this reason comparative figures dealing with percentage of extraction are often misleading and it is better to consider the amount of gold left in the tails. With average amalgamation tailings carrying between $2 and $3 in free gold, it is usually possible to recover all but 30 to 50c. per ton. Such an extraction may not seem high, considered by itself, but when added to the actual recovery made by previous amalgamation it denotes satisfactory work.

Leaching of Pyritic Dumps

Old dumps of pyritic concentrates, often carrying comparatively high gold content, are sometimes encountered. Where the material has previously been treated by plate amalgamation, there is not much likelihood of a satisfactory result with simple leaching. If the dump has oxidized to a considerable extent the gold is exposed to a degree permitting a fairly satisfactory recovery, but the residue is invariably high. Under normal circumstances, the treatment of such a dump will result in complications in the extractor boxes. In isolated districts, however, it may be the only feasible method of recovering a fair proportion of the gold. High cyanide and alkali consumptions are usual, and it is sometimes preferable to amalgamate the gold in a small grinding pan of the Berdan type and trust to comminution to free the precious metal from encasing pyrite.

Monthly Costs Should Be Compared

Monthly costs for each important item, such as cyanide, zinc, lime, etc., should be compiled and calculated per ton of tailings handled. Comparison of monthly estimates will invariably show where opportunities to effect economies lie, and, if used in conjunction with the treatment records, such figures are useful to determine the net economic results of a change in method or a modification in some detail of practice. A form suitable for cost records is shown.

COST BOOK

Month ending ..... 19...
Tonnage .....

Supplies				
Cyanide	lb.	$	$	per ton
Lime	lb.			per ton
Zinc	lb.			per ton
Acid	lb.			per ton
Lubricants	lb.			per ton
Fuel	lb.			per ton
Lighting	lb.			per ton
	lb.			per ton
	lb.			per ton
	lb.			per ton
Sundries	lb.			per ton
Labor				
Filling and discharging				per ton
Sundry				per ton
Sundry expenses				
Assaying				per ton
Bullion expenses				per ton
Repayment of cost of plant *				per ton
Totals and averages		$	$	per ton

* (1) If plant will be valueless at the completion of operations, this will be the total cost of materials and erection divided by the life of the dump in months. (2) If the plant or parts of it can be sold or used elsewhere, calculate an appropriate proportion of (1).

Some persons are immune from any ill effects through contact with cyanide solution. I have known Mexicans who could handle cyanide and strong solution until the epidermis of the hands was completely dissolved, and, too, without apparent discomfort. I speak from experiences that have left very vivid recollections when I say that others are not so fortunate. If there is any real remedy for cyanide rash I have failed to discover it. Persons susceptible to the action of cyanide should avoid contact with the solution whenever possible. In case contact is unavoidable, the operator will do well to reserve a bucket of slightly acid water, in which the hands should be dipped after exposure to the poisonous solution. Rubber gauntlet-gloves should be worn in dressing the zinc boxes, the requisite amount of fresh zinc being teased out by the bare hands before being wetted. For the consolation of the beginner, let me say that where susceptibility is obvious, he should give up hope from the start of eventually overcoming the tendency by continued exposure to the poison. I have seen many attempts of this kind, but never a result which tended to prove that familiarity breeds immunity.

Colorado School of Mines Men in National Service

Colorado School of Mines is well represented in almost every branch of the military service of the United States. Those of last year's graduating class now with the colors are:

Kenneth S. Ferguson, U. S. Marine Corps, Cuba; Charles M. Knepper, captain U. S. N., Government inspector for the Navy, Bethlehem, Penn.; Sydney A. Mewhirter, first lieutenant, Engineers, Fort Riley; Sydney S. Small, first lieutenant, Coast Artillery, Fortress Monroe, Va.; Robert A. Thurstin, Reserve Officers' Training Camp; Lisle R. Van Burgh, first lieutenant, Engineers, Linda Vista, California.

Graduates of former years in various branches of the service are:

Louis R. Ball, captain and military instructor, Colorado Agricultural College, Fort Collins, Colo.; W. S. Beck, 1914, Camp Kearney, Calif.; Gary E. Block, 1908, captain 314th Engineers, Camp Funston, Kan.; A. C. Bigley, 1913, Camp Lewis, American Lake, Wash.; R. G. Bowman, 1911, first lieutenant Co. 3, E. O. R. C., Fort Leavenworth, Kan.; Irving A. Chapman, 1913, coxswain, U. S. S. S. P. 41; David C. Dodge, 1915, second lieutenant, Officers' Reserve Corps; Frank A. Downs, Co. C, 346th Machine Gun Battalion, Camp Lewis, American Lake, Wash.; Carl E. Frey, 1913, Second Officers' Training Camp, Calif.; R. M. Fullaway, Co. B, 4th Engineers, U. S. A., Vancouver, Wash.; Charles W. Hammen, 1914, Aviation Corps, Chicago, Ill.; Wayne A. Harrod, 1916, 25th Co., 7th Battalion, 166th Depot Brigade, Camp Lewis, American Lake, Wash.; Dale D. Hinman, 1915, first lieutenant, Coast Artillery Corps, Fortress Monroe, Va.; Van Dyne Howbert, 1916, Training Camp, Fort Riley, Kan.; E. F. Jones, 1910, Camp Funston, Kan.; Percy Jones, Jr., 1908, U. S. A.; Wallace Lee, 1904, First Battery, Fort Sheridan Training Camp, Fort Sheridan, Ill.; Milton M. Levy, 1916, second lieutenant, 315th Engineers, Camp Travis, Fort Sam Houston, Tex.; Victor A. Light, 1913, U. S. A., Fort Riley, Kan.; Neil M. MacNeill, 1914, corporal, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Emory M. Marshall, 1911, Ordnance Department, Camp Kearney, Calif.; Roy H. Miller, 1916, Co. D, 316th Supply Train, Camp Lewis, American Lake, Wash.; William J. Murphy, 1917, Sergeant Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; James W. Pearce, 1914, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Harold C. Price, 1913, Co. 2, C. A. C., Fort Winfield Scott, Calif.; Charles E. Prior, 1913, first lieutenant, infantry, detailed with motor transportation unit, now in Washington, D. C.; John V. Richards, 1902, Officers' Training Corps, Spokane, Wash.; Ernest J. Ristedt, 1909, first lieutenant, E. O. R. C.; Donald O. Russell, 1909, with the English army in France; W. W. Simon, 1915, U. S. Naval Radio Co. 19, Cambridge, Mass.; Eugene G. Snedaker, 1914, first lieutenant, Engineer Corps, U. S. A., Vancouver Barracks, Wash.; Irwin R. Solomon, 1913, first lieutenant, O. R. C., Chicago, Ill.; Otis W. Swainson, 1910, first lieutenant, Coast Artillery Corps, Fortress Monroe, Va.; G. H. Van Dorp, 1915, second lieutenant, O. R. C., Fort Leavenworth, Kan.; Charles R. Vorck, 1916, corporal, Co. A, 115th Engineers, Camp Kearney, Linda Vista, California.

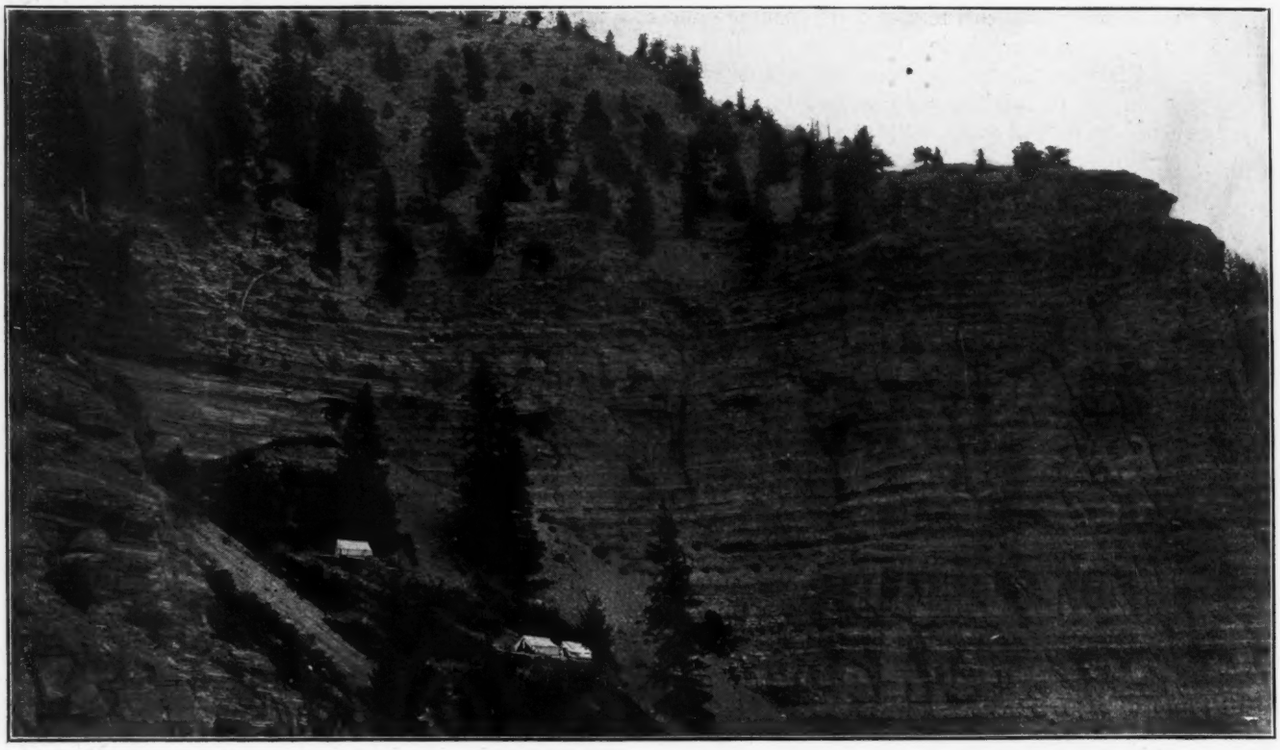
The following men have left school to enter the military service:

Charles N. Beyrle, sergeant, Co. A, 115th Engineers, Camp Kearney, Linda Vista, Calif.; E. L. Bilheimer, Officers' Training Camp; Walter E. Bilisoly, second lieutenant U. S. M. C., Quantico, Va.; L. W. Bird, U. S. A.; Max Boehmer, Camp Lewis, American Lake, Wash.; L. D. Breckenridge, second lieutenant, Marine Corps, U. S. R.; F. A. Brown, corporal, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Routt A. Bryant, U. S. Aviation Corps, in training near Boston, Mass.; Luther J. Buck, second lieutenant, Coast Artillery Reserve Corps, Fortress Monroe, Va.; I. M. Charles, 37th Co., 7th Reg., U. S. M. C., Camagüey, Cuba; S. D. Cunningham, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif., will probably receive commission in Aviation Corps; George W. Cutting, second lieutenant, 342nd Field Artillery, Camp Funston, Kan.; Leo H. Dawson, Aviation Corps, France; H. H. De Laittre, second lieutenant, Infantry, France; Joseph B. Fast, Aviation Corps, Ratoul, Ill.; Walter Finney, Marine Barracks, Mare Island, Vallejo, Calif.; C. W. Fleming, U. S. A., Fort Riley, Kan.; Jesse J. Fushey, first lieutenant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; James V. Galloway, quartermaster sergeant, Co. 8, 65th Depot Brigade, Camp Kearney, Calif.; A. O. Gates, Naval Reserve Station, San Pedro, Calif.; John W. Jeuck, U. S. A., Camp Funston, Kan.; David L. Jones, second lieutenant, Artillery, O. R. C.; Arthur C. Kinsley, first lieutenant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; E. J. Krier, U. S. A.; D. R. Locke, Second Officers' Training Camp, Camp Funston, Kan.; John B. Maynard, lieutenant, Coast Artillery, Galveston, Tex.; J. G. Menke, sergeant, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; John J. O'Malley, second lieutenant, Aviation Corps, in Canada or France; Frank E. O'Neill, second lieutenant, C. A. C., U. S. A., Fort Howard, Md.; Walter T. O'Reilly, West Point Military Academy; L. V. Phillips, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney Linda Vista, Calif.; John A. Poulin, Aviation Corps; John H. Rabb, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; K. W. Reynolds, U. S. A., Fort Riley, Kan.; Carleton E. Richardson, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Fitch Robertson, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; H. A. Robinson, lieutenant, O. R. C.; Roger M. Schade, sergeant, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; A. D. Schoensiegel, Marine Barracks, Mare Island, Vallejo, Calif.; Leslie C. Skeen, U. S. A.; A. W. Stedman, first lieutenant, 6th Reg. Infantry, Fort Oglethorpe, Ga.; C. C. Taylor, first lieutenant, C. A. C., Fortress Monroe, Va.; C. C. Tolman, Aviation Corps; Walter B. Tongue, second lieutenant, Aviation Corps, in Canada or France; Albert E. Townsend, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Henry D. Trounce, lieutenant in English Army; W. H. Williams, second lieutenant, O. R. C., Fort Riley, Kansas.

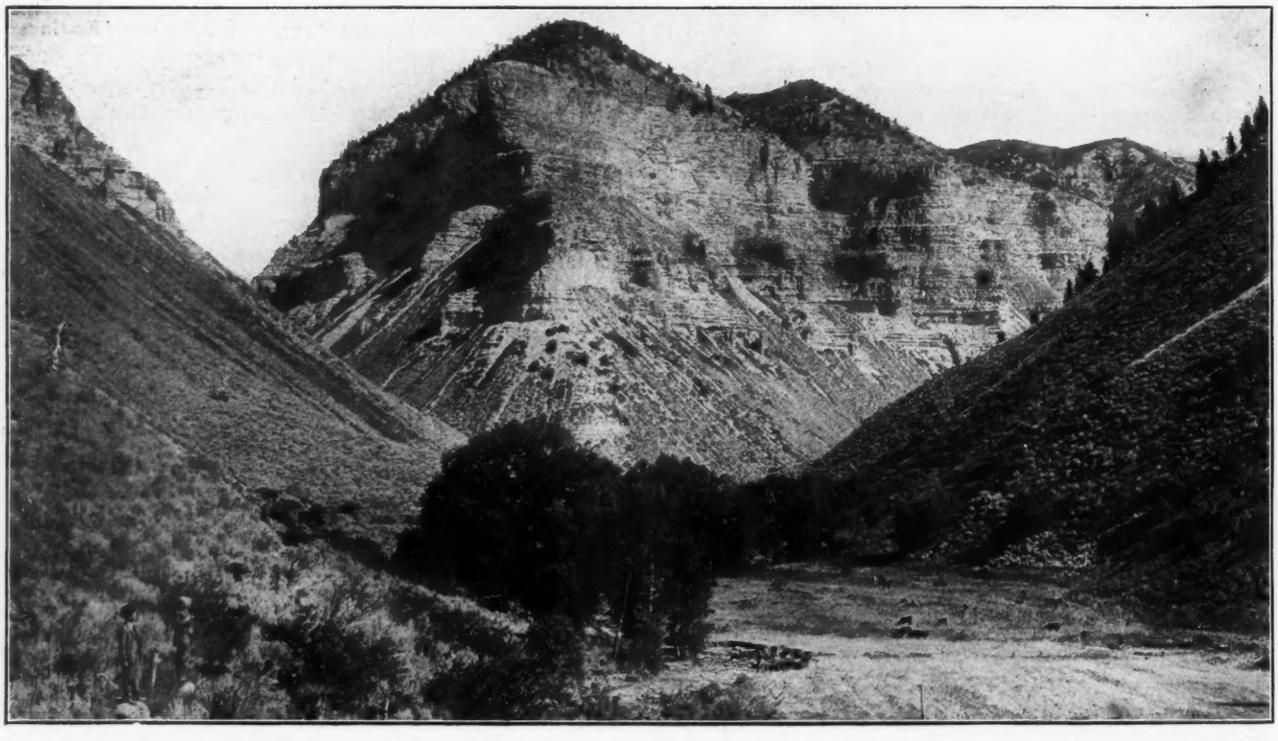
Former professor Carrol George Dolman is captain of Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif. Former Y. M. C. A. secretary Burdette S. Graham is in the U. S. Aviation School. Former coach and athletic director Erle O. Kistler is major, O. R. C. Former Y. M. C. A. secretary Merrill J. Parker is at Marine Barracks, Mare Island, Vallejo, Calif. Former professor Ilo I. Taylor is in charge of Engineering Depot at Fort Lee, Petersburg, Va. From the above list it will be apparent that the Colorado School of Mines is doing its bit.

Sai-nei Iron Mines in Chosen produced in 1916 a total of 73,000 tons of iron ore, all of which was shipped to the Government blast furnace at Wakamatsu in Japan. The Mitsubishi Co., of Tokyo, Japan, has acquired ore lands near this mine and is preparing to open them and to build a blast furnace at Hengho, near the mines.

Photographs from the Field

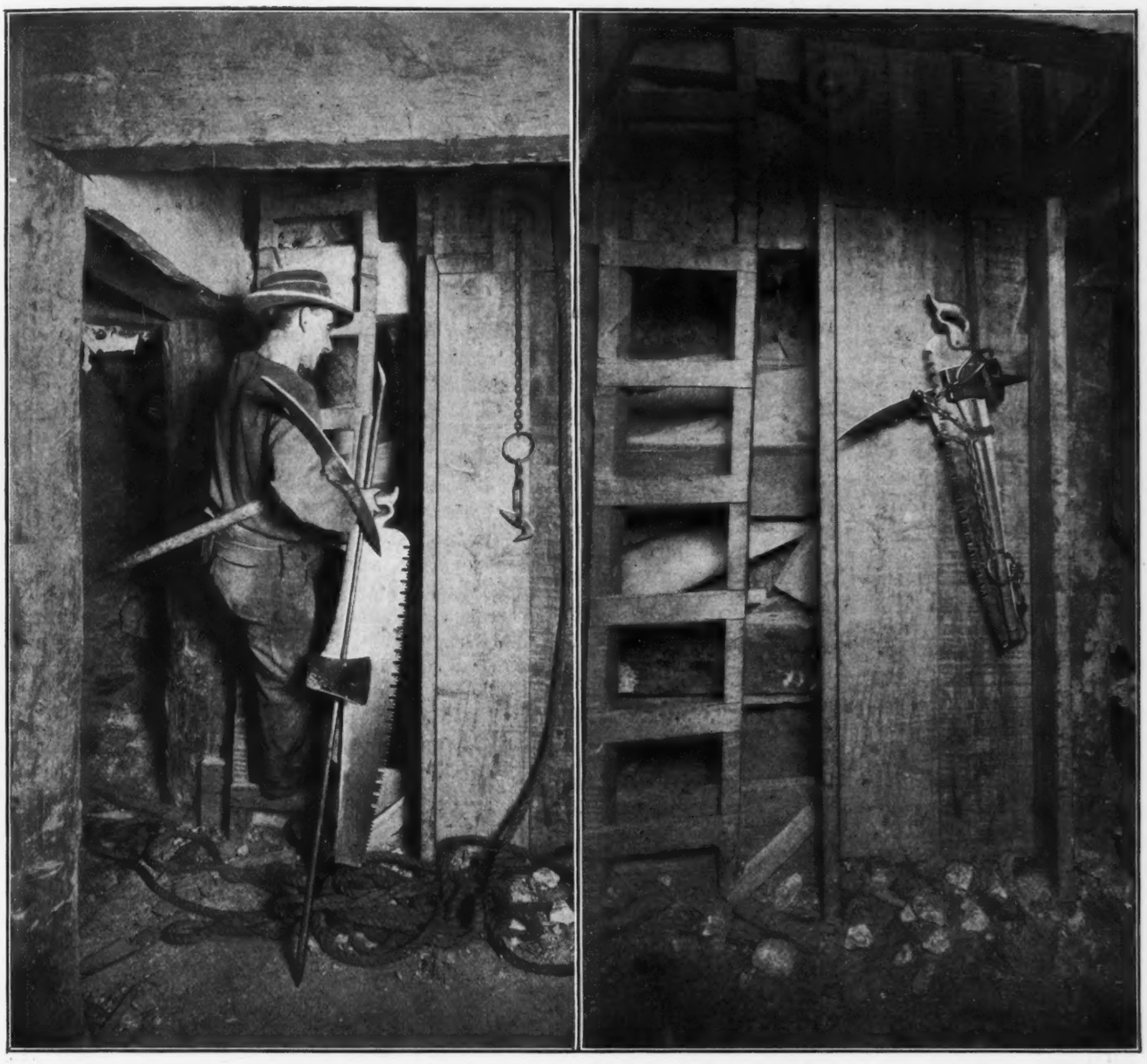


WALL OF OIL-BEARING SHALE ON THE REED-DOYLE PROPERTY NEAR GRAND VALLEY, COLO.

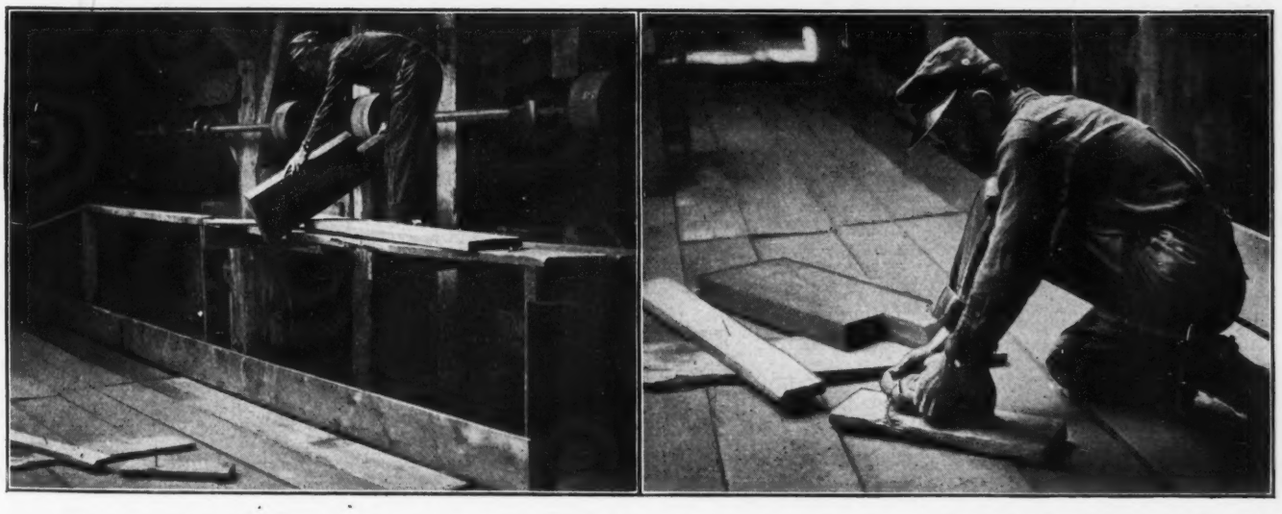


MOUNTAIN OF OIL SHALE ON PARACHUTE CREEK, NEAR GRAND VALLEY, ON DENVER & RIO GRANDE R.R.

Oil-shale deposits of northwest Colorado, southwest Wyoming and northeast Utah have recently been the object of exploitation and experimentation. Near De Beque, Colo., the American Shale Refining Co. is trying out a new extraction process by which it expects eventually to produce 6000 bbl. of crude oil per day



A miner attempted to carry the load, shown at the left, up a manway. He lost his hold on the ladder and fell, cutting himself on the saw and sustaining other injuries. He should have used a rope to raise and lower tools to and from working places, as shown at the right



Millman working on platform jumps down from same and lands on a nail that has been left sticking up in a board. The "Anode," the "safety" paper of the Anaconda Copper Mining Co., is endeavoring to educate the men in safe practices by the publication of bulletins, two of which are reproduced herewith, showing the causes of accidents

PROMOTING "SAFETY FIRST" IN MONTANA MINES

Memorandum on War Excess Profits Tax

Memorandum on the war excess-tax provisions of the Revenue Act of Oct. 3, 1917, filed on behalf of
Utah Copper Co.
Nevada Consolidated Copper Co.
Chino Copper Co.
Ray Consolidated Copper Co.
Chile Exploration Co., and
Braden Copper Co.

By O'BRIEN, BOARDMAN, HARPER & FOX,
120 Broadway, New York,
KURNAL R. BABBITT,
25 Broad St., New York,
ROOT, CLARK, BUCKNER & HOWLAND,
31 Nassau St., New York,
COUNSEL.

Nov. 24, 1917.

The companies on whose behalf this memorandum is filed are all engaged in the mining of copper. They are substantial, prosperous companies. Their aggregate production for the year 1916 was upwards of 509,000,000 lb. of copper, and their production for the year 1917 will be considerably in excess of this figure. The stocks of these companies have not been exploited on the market. They are widely held by large and small investors who have purchased them because of the substantial values in the properties which the companies own. No one of these companies is a war-inspired enterprise. Each of them was organized, acquired its properties and commenced business before the commencement of the war; in fact, with two exceptions, all of these companies were engaged in business for many years prior to 1914.

PRESENT WORDING OF LAW IMPOSES UNJUST TAXES

These companies have accepted the opportunity of submitting this memorandum to the Treasury Department and its advisers not because the application of the War Excess Profits Tax Law to copper companies as such presents any unique problems, but because these particular companies are so circumstanced as regards their capitalization that a strict or technical interpretation of the provisions of the law defining "invested capital" might impose upon them grossly unjust and inequitable taxes. By this is meant that in comparison with other companies engaged in the same or in other businesses whose organizers have been less conservative in the matter of capitalization, these companies would suffer heavily. The copper companies presenting this memorandum are in hearty accord with the Government's fiscal policy. They believe in raising currently as large a portion of the Government's expenses as can be obtained without seriously disturbing business enterprises. They believe, however, that there is a very clear duty imposed upon the taxing authorities so to apportion this burden of taxation that it will rest as evenly as may be practicable upon each and every business in the country; and they have every confidence that the Treasury Department and its advisers will adopt such regulations (or if necessary recommend such legislation) as will remove or minimize injustice and inequality in the apportionment of this tax.

In this memorandum these companies purpose to point out the injustice which would be done their stockholders if an interpretation should be placed upon the definition of "invested capital" which would limit the value of their mining properties to the par value of the stock issued therefor and preclude them from showing the actual value of their properties on Jan. 1, 1914. The bankers who directed the formation of all of these companies and determined the amount of stock to be issued in exchange for the mining properties were substantial and conservative bankers. They were dealing with properties which at the time had been explored only to an extent sufficient to satisfy the bankers that they contained enormous deposits of low-grade copper ore capable of being extracted and put upon the market at a cost which would result in a substantial profit.

The precise extent of the orebodies had not been determined. A large body of ore was assured, a further body of ore was probable and a still further body of ore was possible. The situation at the time these companies were organized and their properties acquired by the issuance of stock was one in which the amount in par value of stock to be issued for the properties depended almost entirely upon the attitude of the bankers engaged in their organization. If these properties had been in the hands of persons who proposed to exploit them on the market, stock could have been issued to a par value representing the utmost expectations of the engineers who had examined the properties, and in every case, as the outcome has proved, such stock would have been fully supported by the actual value of the properties, because in every instance the extent of the orebody has surpassed every estimate made at the time the properties were acquired.

The bankers who formed these companies, however, were not desirous of exploiting them, and they chose the conservative and commendable course of capitalizing their companies at amounts which they felt were well within the limits of the assured values of the properties. The result in every case has been that the stocks issued to acquire these properties are worth many times their par value.

MARKET VALUE MUCH ABOVE PAR VALUE

By Jan. 1, 1914 (the date as of which the amount of the invested capital of a business is to be determined under the War Excess Profits Tax Law), the value of the stocks of Utah Copper Co., Nevada Consolidated Copper Co., Chino Copper Co., and Ray Consolidated Copper Co., as represented by market quotations, was in the aggregate almost four times their par value. The stock of Utah Copper Co., of a par value of a little more than $16,000,000, was worth at market quotations upward of $81,000,000. The stock of Nevada Consolidated Copper Co., of a par value of a little less than $10,000,000, was worth at market quotations approximately $30,000,000. The stock of the Chino Copper Co., of a par value of about $4,300,000, was worth at market quotations a little less than $33,500,000. The stock of Ray Consolidated Copper Co., of a par value of about $15,750,000, was worth at market quotations upward of $28,500,000. The Utah Copper Co. stock and the Ray Consolidated Copper Co. stock each has a par value of $10 per share, while the stock of the Nevada Consoli-

dated Copper Co. and Chino Copper Co. each has a par value of $5 per share. All of these stocks are listed on the New York and Boston Stock Exchanges. In the aggregate these stocks of a par value of about $46,000,000 were worth at market quotations upward of $173,500,000.

This demonstrated value of these stocks was due entirely to the fact that the mineral deposits owned by these companies on further exploration were discovered to be more extensive than had been assumed at the time they were organized, so that the value thus set upon the stock in January, 1914, was an appraisal by the public of the mining properties. It represented in effect the price at which the owners could have sold them, and, to some extent, did sell interests in them. It therefore affords the best data available from which to calculate the invested capital of these companies.

The injustice to which these companies and their shareholders would be subjected if the value of these properties as of Jan. 1, 1914, should be limited to the par value of the stock originally issued therefor, and if these companies should be denied the opportunity of showing the actual value of their properties as of that date, is apparent. It is also apparent that if such a limitation should be imposed upon these companies the loss ensuing would be the direct consequence of the honest conservatism of the bankers who organized them. It is entirely obvious, to take a single illustration from the foregoing, that if the Utah Copper Co. had issued stock to the extent of $81,000,000 for its properties, instead of adopting the conservative course which its organizers chose, the company under any construction of the law would be permitted to count its mining properties as worth on Jan. 1, 1914, the sum of $81,000,000.

Stock Watering Condemned in Earlier Statutes

Stock watering and the issuance of inflated stock have been condemned alike by state statutes, economic writers and publicists generally. A conservative course in the issuance of stock against properties not fully developed has been universally commended. If these companies and their shareholders are forbidden the right to value their mining properties at their fair value on Jan. 1, 1914, merely because a comparatively small amount of stock was issued against these properties in the first instance, then a direct and severe penalty is imposed because of conduct that has heretofore been commended, and by the same token a premium is put on practices that have heretofore been condemned. We have made mention of the value of these stocks as of Jan. 1, 1914, because that is the date fixed in the law for the ascertainment of the invested capital of a corporation whose properties were acquired prior to that date. It is not a date selected by us with a view to obtaining thereby a high valuation for these stocks and thus adding force to our argument. On the contrary, the price of copper at that date had not felt the effect of the enormous demand induced by the war, nor does that date fall within a period of high prices on the stock market. The average price of copper for the month of January, 1914, was 14.45c. per lb., as against an average price for the year 1916 of 28.46c. These stocks which on that date had an aggregate value of $173,500,000 have reached much higher value since that date. In the discussion of this particular point we have made no mention of the Chile Exploration Co. or of Braden Copper Co., for the reason that these two companies seem to call for separate treatment.

Actual Value of Property Should Be Considered

We have no doubt that the hardship and injustice which would result from forbidding these companies to show the actual value of their properties as of Jan. 1, 1914, would fall equally upon any company whose organizers have seen fit to capitalize it at a figure which they thought was conservative or low and which in fact has proved to be much less than the actual value of the properties acquired by the company in exchange for its stock. It must be, therefore, that facts similar to those which we have presented have been brought to your attention by corporations similarly circumstanced. We shall not presume to suggest the precise method of working out a result whereby a corporation shall be permitted to show the fair value of its properties as of Jan. 1, 1914, without regard to the accident of how much in par value of stock was originally issued for these properties. It may be that regulations following in principle those promulgated under the Federal Capital Stock Tax Law of 1916 would afford the necessary relief. It may be that relief might be had through regulations issued under the provisions of the War Excess Profits Tax Law which permit corporations to include in invested capital the paid in or earned surplus used or employed in the business. For example, a regulation which permitted a corporation to revalue its properties as of Jan. 1, 1914 (either by reference to the market value of its stock outstanding or on some other basis which safeguards the Government but is fair to the corporation) might afford relief. If legislation should be necessary, the relief would be readily obtained by striking out from the definition of invested capital the phrase "but in no case to exceed the par value of the original stock or shares specifically issued therefor."

The precise manner by which justice is to be done to undercapitalized corporations is necessarily to be determined by the Treasury Department and its advisers. There should, of course, be all proper safeguards to the Government, but we submit that justice and fair dealing in the distribution of the burdens of Government expense require the discovery of some method which with such safeguards will permit every corporation to demonstrate to the Internal Revenue Department the fair value of its property as of Jan. 1, 1914.

Effect on Holding Companies

We have heretofore discussed the injustice which would be done four of these companies if in ascertaining their invested capital as of Jan. 1, 1914, they should be limited as regards their mining properties to the par value of the stock issued therefor. We purpose now to discuss the effect of such limitation upon the other two companies, Chile Exploration Co. and Braden Copper Co. Both of these companies own mining properties situated in the Republic of Chile. Because of the provision of the Chilean law which in effect makes it impracticable to mortgage mining properties, the bankers who undertook the financing and development of these properties found it necessary to form in each case two companies, one to own and operate the mines and the other to hold the stock of the operating company.

With this corporate structure it became possible for the holding company to issue its bonds and pledge as collateral security therefor stock of the operating company, and thereby confer upon the bondholders an indirect lien upon the property in Chile. Inasmuch as all of the stock of the operating company was to be held by another corporation, the amount in par value of such stock was a matter of entire indifference. The stock of the holding company in each case was to be held publicly, and the only thought given by the bankers to the question of capitalization concerned the relation between the value of the mining properties and the stock of the holding company. The bankers engaged in the formation of these companies were conservative and substantial people, and in respect to the capitalization of the holding company they adopted the conservative policy of an undervaluation rather than an overvaluation of the mining properties which furnished the support for this stock. On this particular point, however, it is unnecessary to add anything to what we have already said with respect to the other companies.

The situation in which these two operating companies find themselves differs in one important respect from the situation of the four other companies. These operating companies own the mines and receive, in the first instance, the income which is subject to tax under the War Excess Profits Tax Law. They are the companies which must make the returns and include therein a statement of their "invested capital." If a technical construction were placed upon the definition "invested capital," a construction which considered the form rather than the substance of this corporate situation and which by so doing limited the invested capital of these two operating companies to the par value of the stock issued by them, a result most inequitable and unfair to these two businesses would be reached.

Holding Company Capitalization Not Based on Property Value

The amount at par of the stock issued by these two operating but subsidiary companies bore no relation whatsoever, and was not thought by any one to bear any relation whatsoever, to the value of the mineral properties. In the case of Chile Exploration Co., the par value of its stock was $1,000,000—while the par value of the stock of its holding company (Chile Copper Co.), the amount of which was thought to represent conservatively the value of the properties, was $95,000,000. In the case of the Braden Copper Co. the amount of its stock was $2,332,030 par value, while the par value of the stock of its holding company (Braden Copper Mines Co.) was $12,953,530.

The stock of Chile Copper Co. (par value $25) was first listed on the exchange in April, 1915, on which day it sold at $21.25, making a total value at market prices for the stock of Chile Copper Co. of upward of $80,000,000. For the year 1915 the market prices of Chile Copper Co.'s stock ranged from $17¾ to $26¾. For the year 1916 from $19⅝ to $39¼, and from Jan. 1 to June 1, 1917, from $20 to $27⅝. The stock of Braden Copper Mines Co. (par value, $5) was listed on the exchange prior to January, 1914. On Jan. 2, 1914, the lowest sale was $7 per share, making a total value for the stock at that date of upward of $18,000,000. The value of the stock steadily increased. In November, 1915, the Kennecott Copper Corporation, having already acquired a substantial interest in the stock, offered to pay in cash $15 for each share of stock in Braden Copper Mines Company.

The Case of the Chile and Braden Companies

In the case of Chile Copper Co. and Braden Copper Mines Co., their stock represents solely the indirect proprietorship of the mining properties owned by their respective operating companies, and the values placed upon the stocks of the holding companies as indicated above furnish a true appraisal of the actual values of these mining properties. In other words, the mineral properties which Chile Exploration Co. holds against its $1,000,000 par value of its stock were appraised by the public in 1915 at upward of $80,000,000. Similarly the properties against which the Braden Copper Co. issued slightly over $2,300,000 of its stock were appraised by the public in January, 1914, at upward of $18,000,000 and were appraised by Kennecott Copper Corporation in 1915 (through its purchase of shares of the holding company at $15 each) at almost $39,000,000.

Enough has been said on this subject to show the tremendous injustice which would be done these companies and their stockholders by adopting an interpretation of the law so literal and technical as to limit the valuation of the mineral properties of Chile Exploration Co. and Braden Copper Co. to the par value of the capital stock which these two companies issued against the mineral properties. It is submitted that in situations such as these, involving a holding company whose stock is publicly dealt in and an operating company whose stock is all held by the holding company, an equitable administration of the law imperatively requires the disregarding of the form of corporate structure and calls for regulations which will permit such an operating company to regard the stock of the holding company issued and dealt in publicly as virtually the stock of the operating company.

It is not conceived that any argument that we could make would add to the impression that must already have been made by these two actual and definite and not hypothetical situations. In neither of these instances has the par value of the operating company any relation whatsoever to the value of its assets. It seems to us that it is incumbent upon the Treasury Department to treat the holding company and the operating company as a single company and that if the amount of the issued stock is to be a factor in determining invested capital, the stock issue of the holding company is to be looked to.

Conservative Capitalization Penalized

With respect to both of the foregoing suggestions, we earnestly desire to call to the attention of the Treasury Department and its advisers what we belive to be the situation of a great number of corporations throughout the United States. It is true undoubtedly that the public has often been gulled into the purchase of stock issued on a vastly inflated basis, and so there has arisen an entirely justifiable prejudice against the evil of watered stock. It is right for the Internal Revenue authorities to protect itself in the matter of invested capital by such regulations as will not permit watered stock to constitute a basis of value. The fact is, how-

ever, that the issue of watered stock is confined to those corporations whose promoters purposed, following the organization of the corporation, to sell out to a more or less gullible public. A great number of corporations, however, for the purpose of economy in formation, economy in operation, and because of the conservatism of the men who formed them, even when it was expected that the stock would be sold on the market, have been conservatively capitalized or greatly undercapitalized.

Admitting the evils of stock watering, and even if it were admitted that it has been more prevalent than it has been, what is to be thought of that construction of law which makes the course of a corporation whose stock has been watered so easy, and the course of that corporation whose stock has been conservatively issued, or purposely issued to an inadequate amount, considering its assets, so difficult, not to say hopeless?

It seems to us that it would not be putting an undue burden on the Treasury Department to make the stock issue only *prima facie* evidence of property value, giving to the department full authority and complete machinery for easily overcoming this *prima facie* presumption as against the corporation whose stock is watered, but providing machinery also which will accord justice to corporations which can show by unquestioned and unquestionable evidence a value of their property—whether held by themselves directly, or held by them through some subsidiary company—in excess of what happens to be the par value of their own or their subsidiary's stock.

Government Lease of Potash Lands

From the Department of the Interior comes the statement that on Dec. 5, 1917, Secretary Lane issued regulations under which permits may be obtained to prospect for potash on public lands of the United States. Heretofore, for some years all lands known to contain potash have been withdrawn from public acquisition.

Hereafter known potash lands may be acquired only by lease from the Government. This is the first time the United States has leased its lands, excepting the coal lands of Alaska, which two years ago came under a leasing bill passed by Congress. The other mineral lands which Secretary Lane has asked Congress to place on a leasing basis are those bearing coal, oil and phosphate, of which there are now many millions of acres under withdrawal. Bills to permit the leasing of these lands have twice passed the House, but have not been passed by the Senate.

Permits may be issued to citizens, associations and corporations of the United States for the exploration of not exceeding 2560 acres each of land in compact form, the permits to be for a period of two years. If the permittee discovers potash in commercial quantity and quality he will be entitled to a patent for one-fourth (640 acres) of the area of his permit, the remainder to be subject to lease by the Government. Applications for permits must be filed in local United States Land Offices. In a few days Secretary Lane will issue the regulations to govern the leasing of public lands containing potash deposits. The prevailing high market and the great demand for soluble potash salts should be an incentive to explorations.

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

AUGUST, SEPTEMBER, OCTOBER AND NOVEMBER COPPER PRODUCTION, 1917

	Aug.	Sept.	Oct.	Nov.
Alaska shipments	3,891,621	8,501,806	10,763,500	.....
Arizona:				
Arizona Copper	nil	nil	1,568,000	.....
Cons. Ariz. Smelting	1,450,000	1,450,000	1,930,000	1,800,000
Inspiration	nil	2,250,000	2,400,000	2,500,000
Miami	260,000	1,900,000	2,673,775	3,361,426
New Cornelia	1,996,587	1,460,936	2,278,000	2,106,000
Old Dominion	875,000	1,225,000	2,623,000	2,844,000
Ray	7,749,509	7,413,881	7,700,000	7,600,000
Shannon	nil	nil	nil	.....
Other Arizona	22,829,806	24,085,753	25,223,854	28,163,233
California:				
Mammoth	1,725,000	1,280,000	1,590,000	1,500,000
Michigan:				
Calumet & Hecla	12,338,735	11,556,438	12,265,380	.....
Other Lake Superior *	8,000,000	7,000,000	7,000,000	.....
Montana:				
Anaconda	11,175,000	2,800,000	22,336,460	21,660,000
East Butte	1,676,360	2,203,300	1,691,008	2,033,000
Nevada:				
Mason Valley	1,417,717	1,267,532	1,469,631	.....
Nevada Cons	6,439,984	6,524,352	7,000,000	6,900,000
New Mexico:				
Chino	6,824,127	7,719,496	6,333,000	6,313,272
Utah:				
Utah Copper	18,796,012	17,839,378	18,100,000	16,300,000
Eastern smelters *	2,000,000	2,000,000	2,000,000	2,000,000
Total reported	109,445,458	108,477,872	136,945,608	.....
Others, estimated	20,000,000	20,000,000	20,000,000	.....
Total United States	129,445,458	128,477,872	156,945,608	.....
Imports, ore and concentrates, etc	13,447,348	16,892,867	.....	.....
Imports in blister, etc	34,546,504	22,030,450	.....	.....
Grand total	177,439,310	167,401,189	.....	.....
British Columbia:				
Canada Copper Corpn	212,772	537,229	724,961	.....
Granby Cons	3,836,770	3,321,754	3,259,974	.....
Mexico:				
Boleo	1,433,040	1,454,880	.....	.....
Cananea	nil	nil	nil	nil
Other Foreign:				
Braden	4,512,000	5,348,000	5,414,000	5,756,000
Cerro de Pasco	6,036,000	7,041,000	7,325,032	6,440,000
Chile	8,036,000	3,294,000	9,050,000	8,872,000
Cape Copper	178,573	nil	246,400	.....
Kyshtim	902,700	582,400	.....	.....
Katanga	5,445,360	4,960,350	5,092,625	.....

* Estimated.

The total production of the United States for the first nine months of 1917 was as follows:

January	174,658,603
February	183,859,588
March	192,211,648
April	188,685,898
May	187,750,810
June	173,341,047
July	129,810,739
August	129,445,458
September	128,477,872
October	156,945,608
Total	1,645,187,271

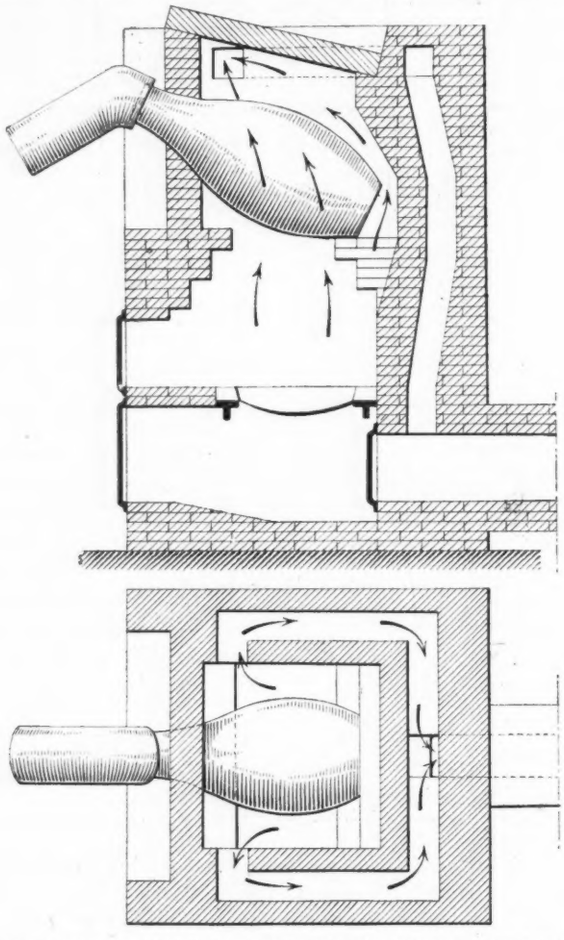
The grand total, which in the case of August was 177,439,310 lb., includes, under "Imports in ore and blister copper" the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production August to November was 7,048,000; 7,100,000, 7,116,000 and 7,142,000 lb., respectively.

Details of Milling and Smelting

Cherry Distillation Furnace

A type of furnace used in Trenton, N. J., for the redistillation of copper is shown in the sketches presented herewith, which are sufficiently explanatory of the design and construction. The furnace is covered by U. S. Pat. 1,231,239, June 26, 1917, and was designed by Edward E. Cherry, of Trenton, New Jersey.



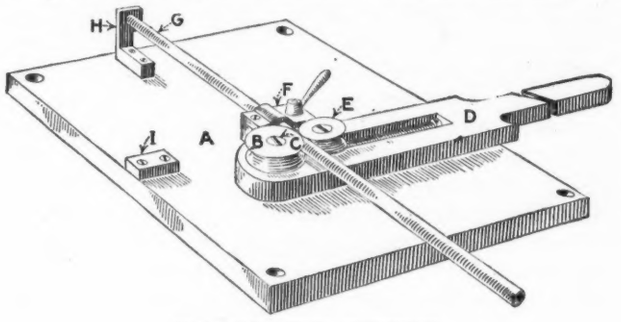
PLAN AND SECTIONAL ELEVATION OF CHERRY FURNACE

Pipe-Bending Device

A device that has been used with success for bending pipe and boiler tubes and that may have other applications is shown in the accompanying sketch, described in the *American Machinist* by Stephen Jaross.

The iron base *A* carries a pilot roller *B* the size of the required bend minus spring-back of the work. The pin *C*, which acts as a fulcrum for *B*, is also the fulcrum for the lever *D*, which carries at *E* a similar roller to *B*. The roller *E* is adjustable to and from *C* to permit various sizes of pilot rollers *B* to be used. At *F* is a clamp for the tube *G*, and at *H* a stop for the end of the tube. At *I* is an adjustable stop, as the tube will spring back slightly. If a different-size circle is desired, the roller *B* must be changed accordingly.

The grooves in the rollers *B* and *E* should be turned about 0.010 in. deeper than the radius of the pipe. As the pipe is only $\frac{1}{16}$ in., it should be filled with fine, dry sand plugged tight on the ends, and heated on the portion that is to be bent. The sand will help to retain the shape of the pipe and to hold the heat longer for the operation. The bend often can be made in one operation.



PIPE-BENDING FIXTURE

Cost of United Eastern Equipment at Oatman, Ariz.*

After the development of its new mine, the United Eastern Mining Co., decided to install a reduction plant. The tonnage to be treated at the start was fixed at 200 tons, but, in view of the favorable condition of the mine, it was considered advisable to arrange facilities for increasing the capacity to 400 tons. While it is best in some cases to adopt a distinct independent unit system where future enlargement is contemplated, in this instance the plans worked out differently.

A comprehensive idea of the total cost of the installation as well as of the individual departments can be had from the attached cost distribution. Taking, for the purpose of comparison with the cost of other cyanide plants, what is generally understood to be part of a milling plant, such as crushing plant, mill proper, and refinery, shops, offices, storehouses, assay office, and inclined railroad for distributing purposes, and allowing liberally for extending the cyanide plant to 400 tons capacity, the cost of the plant per ton of ore treated daily amounts to $520. This is a very low figure in view of the fact that the mine is situated 28 miles from the nearest railroad station and all the material had to be transported by motor truck or wagon, and that the purchasing orders were placed at a time when the various machines and materials were averaging at least 15% above normal.

The compactness of the plant, including the principal departments, such as crushing, milling and refining,

*Excerpt from a paper, entitled "The United Eastern Mining and Milling Plant," by Otto Wartenweiler, to be presented at the February meeting of the American Institute of Mining Engineers at New York.

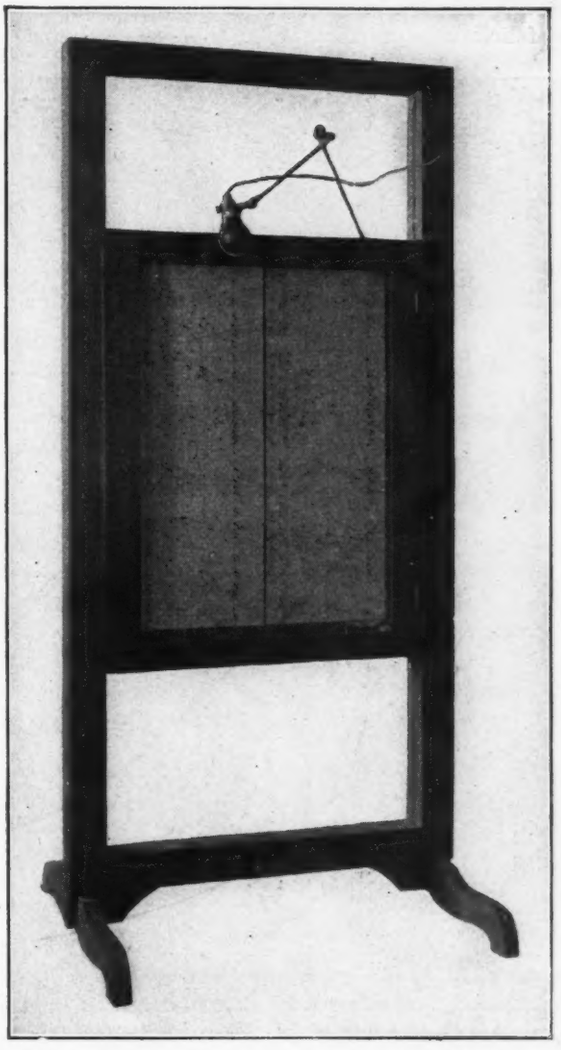
is shown by comparison with two other cyanide plants recently designed by myself; one 500-ton plant occupies 112 sq.ft. and one 350-ton plant, 110 sq.ft. per ton of ore treated, while the United Eastern installation on a basis of 400 tons covers an area of only 70 sq.ft. per ton of ore capacity. The cost per ton treated of the 500-ton mill, with the main mill being constructed of steel, was $930, while the 350-ton plant of identical construction as the United Eastern cost $681 per ton of ore treated. Both of these mills are situated on branch line railroads and were built at a time when prices of material were normal.

SUMMARY OF CONSTRUCTION COSTS AS AT JAN. 31, 1917, UNITED EASTERN PLANT

Account Title	Labor	Material	Power	Miscellaneous	Total
Mine:					
Headframe	$1,687.35	$2,480.00	.....	$33.75	$4,201.10
Compressor and hoist house	3,904.24	19,730.42	.....	.....	23,634.66
Timber framing shed	340.39	835.80	.....	.....	1,176.19
Blacksmith shop	211.57	1,644.89	.....	.....	1,856.46
Change house	699.42	1,090.84	.....	1.00	1,791.26
Foreman's office	88.88	142.75	.....	.....	231.64
Timber yard	408.84	428.59	.....	.....	837.43
Change room, No. 1 shaft	79.00	118.98	.....	.....	197.98
Blacksmith shop, No. 1 shaft	12.00	14.12	.....	77.19	103.31
Hoist house and equipment, No. 1 shaft	351.86	4,300.40	.....	.....	4,652.26
Powd r magazine	269.62	250.80	.....	.....	520.42
Mill:					
Mill proper	32,211.08	90,328.04	$135.81	10,864.16	133,539.09
Crushing plant	2,456.50	9,504.81	.....	14.06	11,975.37
Coarse ore bins	953.97	962.30	.....	.....	1,916.27
Refinery	2,093.52	3,695.61	.....	.....	5,789.13
Lime house	146.32	126.22	.....	.....	272.54
Miscellaneous:					
Machine shop	815.02	7,407.92	.....	.....	8,222.94
Storehouse	824.74	2,266.60	.....	.....	3,091.34
Transformer house	517.64	4,109.53	.....	.....	4,627.17
Assay office	457.90	1,711.77	.....	.....	2,169.67
Oil house	35.50	101.61	.....	.....	137.11
Inclined tramway	224.02	880.84	.....	.....	1,104.86
Garage, No. 1 shaft	38.00	2.35	.....	97.25	137.60
General office	1,215.11	5,122.99	.....	120.00	6,458.10
Cottages	712.05	2,477.05	.....	.....	3,189.10
Blueprint house	28.00	59.58	.....	.....	87.58
Water system	2,197.34	18,780.23	.....	3,321.31	24,298.88
Power lines	610.99	432.72	.....	6.94	1,050.65
Local telephone system	87.69	226.74	.....	.....	314.43
New roads	840.40	43.38	.....	.....	883.78
Total mining and milling plant	$54,516.96	$179,277.89	$135.81	$14,535 66	$248,468.32

Perpetual Stock-Inventory Board

A visible inventory board that can be kept in the warehouse to show at a glance whatever supply parts should be replaced has been designed by G. G. Porter, who describes the board in *American Machinist*, of Oct. 25, 1917. Time is lost in continually looking over cards to see that parts which have dropped below the maximum quantity are reordered to meet requirements. The accompanying illustration shows the visible stock board, which, since its installation, has proved a time-saver. To economize room both sides of the board are made alike. The uprights of the frame are made hollow and carry counterweights. This allows the board, which is 36 in. wide by 42 in. high, to be raised or lowered for the convenience of the person in charge of it. The center of the board is made of soft wood and is covered on each side with hard felt about 1¼ in. thick. The felt is covered with cross-section paper 10 to 1 in., on which the records are made. Black and red pins are used to indicate the number of parts on hand, the position of a pin opposite a part indicating the number of those parts in finished stock, each vertical line from the left next to the part representing a single piece up to 100 lines. To the right, each vertical line represents 100 finished parts in stock. The vertical lines representing 50, 100, 500, 1000, etc., are made heavier than the others. The operation of the device is as follows: All parts that go into the manufacture of products, whether made in the shop or purchased elsewhere, are numbered and listed on the board under the proper headings, which also correspond to the perpetual-inventory cards. When the parts drop below minimum, the stock keeper starts through a requisition for another order and inserts a green pin over, or to the left of, the part name. When



A TIME-SAVING PERPETUAL STOCK-INVENTORY BOARD

the stock is out and the job started through the shop, the green pin is moved to the right between the part name and number, where it remains until the job is completed. A list is kept each day of finished parts received into or delivered from the finished-stock room, and from this list the next morning the finished-stock clerk posts the cards and changes the location of the pins. Glass doors fitted with lock and key protect board and protect the pins.

Pebbles for Regrinding Mills at Plymouth, Calif., are obtained from the tailings piles of the Natomas dredges in Sacramento County. Men are employed to sort the proper sizes and hardnesses, giving attention to the symmetry of the stones—chiefly dolomite. Grinding pebbles of fine quality are also found on the ocean beach in Santa Barbara County and are used by the Riverside Portland Cement Company.

Mining and Metallurgical Machinery

Progress in Steel-Pipe Manufacture

During the last 30 years the improvement in steel pipe has reflected the advance in metallurgical methods and fabricating practice. Steel pipe was first made in 1887, although the tonnage was practically negligible, but today the production approaches 3,000,000 tons per year. The many uses to which steel pipe has been put demand that it meet the most rigid requirements. That the product has met this test is proved by the many instances where it has been successfully subjected to unusual strains and conditions.

It is interesting to note some of the peculiar experiences in the various uses of steel pipe, which, while unusual and without duplication, demonstrate the advance of present-day manufacture. The illustrations are shown by the National Tube Co. as examples of the inherent qualities of "punishability" of its steel pipe.

Fig. 1—Not a break was shown on any of the 26 lengths of this 4-in. casing, completely blown from a Texas oil well

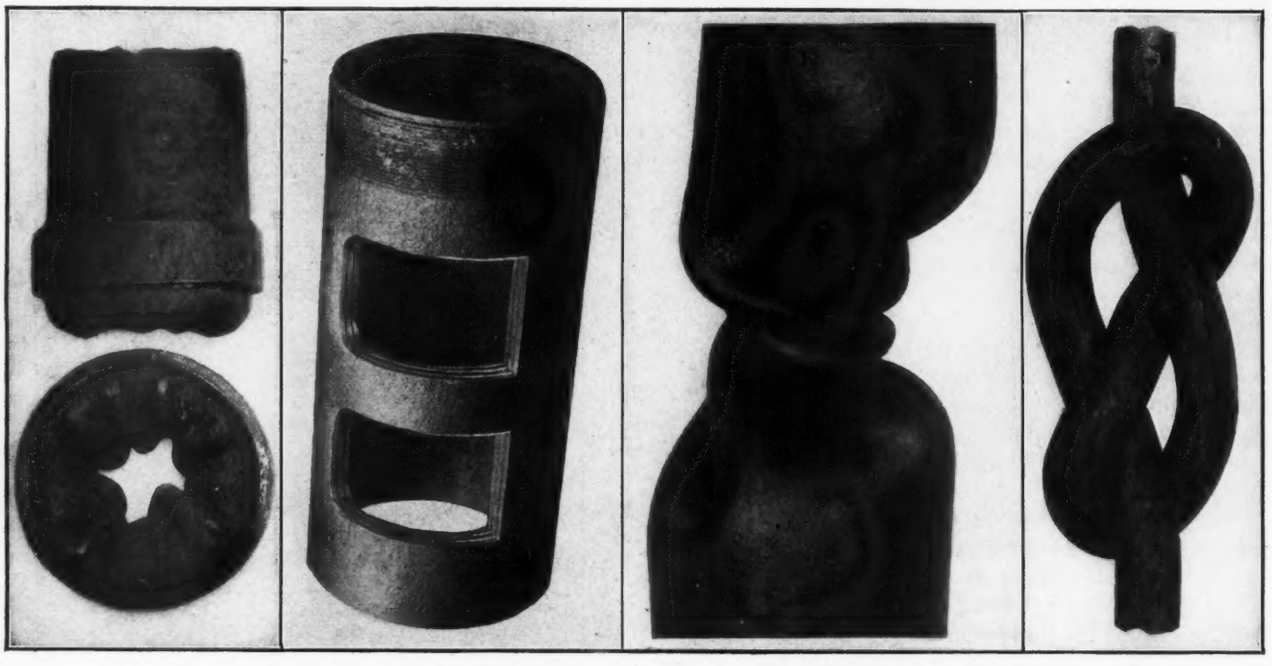


Fig. 2 Fig. 3 Fig. 4 Fig. 5

Fig. 2—Two views of the bottom length of a 10-in. casing, 340 ft. long, after falling 236 ft. in a well. Fig. 3—Telescoped tube resulting when 1440 ft. of 8¼-in. steel casing fell 200 ft. in a well. Fig. 4—A section of 8-in. pipe subjected to a twisting strain of 713,000 in.-lb. Fig. 5—A bow-knot made from pipe

Fig. 6—Originally this casing was 18 ft. long, but it was reduced to one-third of its length and greatly distorted when subjected to an explosion of 170 quarts of nitroglycerine

EXAMPLES SHOWING REMARKABLE QUALITIES OF "PUNISHABILITY" OF MODERN STEEL PIPE

Fig. 1 shows an occurrence at one of the Texas oil wells. The well was about 2000 ft. deep and the 4-in. casing was being removed when gas began to show. The remaining casing—26 lengths, or about 500 ft.—was completely blown from the well, without showing a sign of a break on any of the 26 lengths. Fig. 2 shows two views of the bottom lengths of a 10-in. casing, in an Oklahoma oil well, after the casing had fallen 236 ft. The entire casing, 340 ft. in length and weighing 32.5 lb. per ft., was being hoisted when the elevator holding the casing let go and the casing hit the bottom of the well. The thread protector was forced over the threads and up over the pipe 12 or 13 in. and the pipe was bent backward and inward, but no fracture was developed.

The section of pipe shown in Fig. 3 was machined to show three sections of casing telescoped together when a string of casing fell to the bottom of a well in Ohio. A string of 1440 ft. of 8¼-in. steel casing, weighing over 34,000 lb., was being hoisted, when the entire string fell 200 ft. to a bottom of limestone. The three bottom sections were telescoped, one inside and one outside, but with no sign of a break or crack, and the exterior apparently shows a straight length of uninjured casing.

Fig. 4 shows a piece of 8-in. line pipe subjected to a twisting strain of 713,000 in.-lb. This pipe has a thickness of about ⅜ in. and weighs 29 lb. per ft. Fig. 5 shows a bow-knot made from pipe. Both of these are laboratory experiments, but demonstrate the remarkable endurance of steel pipe.

Fig. 6 shows a piece of $5\frac{3}{16}$-in. steel casing originally 18 ft. long, which has been reduced to one-third of its length, twisted and distorted, but shows no sign of fracture. The casing was stuck in an oil well in Ohio, and in attempting to remove it, at the same time "shooting" the well, 170 quarts of nitroglycerine were placed in the well and shot off. The effect of the explosion on the casing is shown, the pipe having been extracted from the hole with great difficulty.

Process for Electro-Plating Aluminum

The United Smelting and Aluminum Co., Inc., New Haven, Conn, announces that it has a patented process for electro-plating aluminum, which follows closely the standard process of electro-plating other metals, and from which the same uniform results are obtainable as with other metals. As far as is known to the company, this is the only successful method whereby aluminum may be plated with nickel, silver, copper, etc. The process is equally applicable to pure aluminum in sheets, rods, wire, tubing, etc., and to aluminum alloyed with other metals, as in molded or die castings.

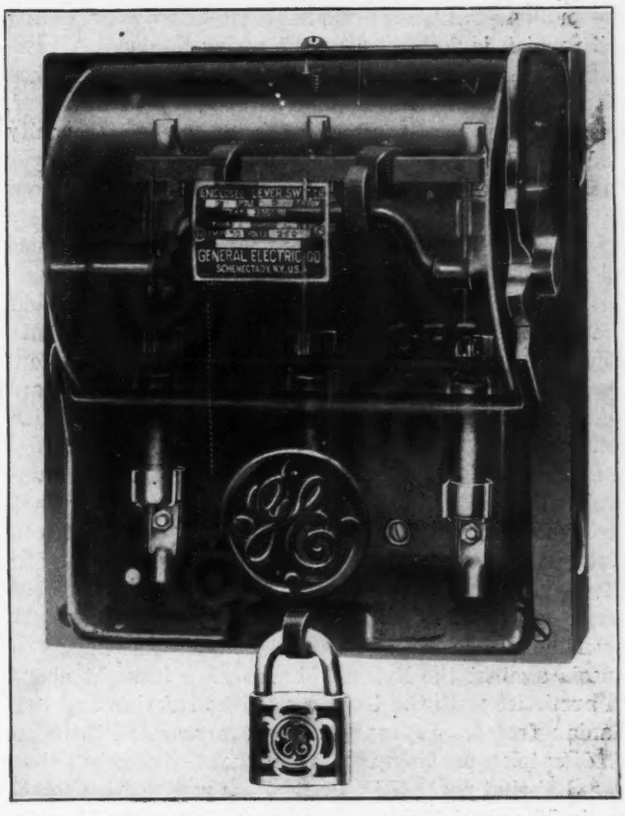
Nickel-plated aluminum is strengthened by the nickel, which is desirable in fragile work; also the article may be firmly soldered, by the ordinary method of soldering. The process, it is claimed, will be of great advantage to many companies now making brass and copper products.

Saltpeter Price Fixing is being studied by the Chilean Government with a view to centralizing sales to the Allies and munition manufacturers. It is urged by producers that regulation will not be possible unless prices of supplies to the mines are also brought under government control.

General Electric Safety Switch

The General Electric Co. of Schenectady, N. Y., first marketed lever switches enclosed in safety-first iron casings a year ago. The protective advantage offered by the new type met approval, but the designing engineers did not neglect experimentation which might better both the performance and purpose of the switches, and have now put on the market still another type, which is considered foolproof.

The illustration of the new switch here reproduced shows not only the exterior protective casing, which is of sheet metal, but also, in phantom, the working parts and the slate base. The padlock at the bottom prevents



GENERAL ELECTRIC ENCLOSED SAFETY LEVER SWITCH

tampering with the fuses in the lower part of the switchbox and the switching lever at the upper right hand side cannot be closed while the covering over the fuses is open, and vice versa.

It was assumed that this interlocking arrangement would give sufficient protection, but new conditions necessitated further changes. It was observed that although one of two or three operators may throw on the switch with perfect safety, he may at the same time endanger another operator working on a machine the motor of which gets its current through that switch. To meet this condition provision has been made for three locks, each controlled by a different individual, and all operators may thus be kept thoroughly in touch with what is going on. If required, these switches will also be provided with spring catches which must be pressed down while the switching lever is moved. Both hands must thus be used to switch the electricity on or off and further safety is achieved. Modern practice makes the use of this new switch of advantage wherever "front-connected" knife switches are required.

Events and Economics of the War

On Dec. 7 Congress declared that a state of war exists between the United States and Austria-Hungary. Government control of railroads or operation of the roads as a unit under centralized management has been recommended by the Interstate Commerce Commission; the President is said to favor the former, with actual operation by the Railroads' War Board. The War Trade Board has published a list of firms in foreign countries trading with which is forbidden except under license. A reorganization of the Council of National Defense has taken place; the coöperative committees have been dissolved, one member of each remaining in an advisory capacity and as a Government employee. The U. S. destroyer "Jacob Jones" was torpedoed in European waters, about 65 lives being lost. Steps are being taken by the Government and by Great Britain to protect the Tampico oil fields in Mexico.

The blowing up of the French Line steamship "Mont Blanc," on Dec. 6 at Halifax, caused the death of about 2500 persons, 3000 more being injured and many thousands left destitute, through the wrecking of two square miles of the city by the concussion and the fires which followed.

In France, by a surprise counter attack in the Cambrai salient, the Germans took 8000 British prisoners and recovered part of the territory previously lost. In Italy, in a renewed offensive on the Asiago Plateau, the Teutons won several strong positions and took 15,000 prisoners; the main lines of the Italians still hold. A revolt headed by Kaledines and Korniloff has begun in Russia against the Bolsheviki who have brought about an armistice with the Germans on the Russian and Rumanian fronts. Japanese troops are reported to be in Vladivostok guarding the large quantities of supplies stored at that port. Bulgarians have renewed the fighting in Macedonia. Jerusalem has been captured by the British troops under General Allenby in Palestine. Ecuador has severed relations with Germany.

War To Cost Thirty-Six Billions for First Two Years

The cost of the war to the American people, including loans to the Allies, for the two years ending June 30, 1919, will be at least 36 billions, according to the figures placed before Congress by Secretary McAdoo upon the opening of the second session. Estimated receipts for the current fiscal year are $12,580,732,800, which, with a balance in the Treasury on June 30 last of $1,066,983,361, makes a total of $13,647,716,161. Most of the receipts, or $8,686,000,000, are from sale of bonds and war-savings certificates; ordinary receipts are $3,886,000,000, largely from war taxes; and the Panama Canal income is $7,000,000.

Ordinary disbursements are estimated at $12,316,295,223; loans to Allies in the year at $6,115,000,000; public debt disbursements at $321,031,732, and Panama Canal expenses, $23,593,000; making total estimated disbursements, $18,775,919,955.

In order to allow for a balance in the general fund of about $500,000,000 on June 30 next, Congress must authorize the raising of about $5,640,000,000 additional funds. This figure, with the $3,666,000,000 of authorized but unissued Liberty bonds, and $663,000,000 estimated receipts from war savings, makes the $9,969,000,000 which Mr. McAdoo believes Americans must loan the Government between now and June 30, 1918.

For the next fiscal year, ending June 30, 1919, the Secretary estimated receipts at $5,176,000,000, and disbursements at $12,804,034,440, exclusive of Allied loans. This makes a $7,627,000,000 excess of disbursements. If the present rate of loans to Allies is continued in the 1918-19 fiscal year, $6,000,000,000 additional would be required. Estimated interest on bonds to be issued that year is $385,000,000, and estimated expense of floating the bond issues $28,000,000. Thus, if the deficit is to be met by bonds, $14,040,000,000 worth must be floated between July 1, 1918, and June 30, 1919, in addition to receipts from war savings.

Eastern Roads To Control Traffic in Iron and Steel Exports

Control over the entire export traffic of the Eastern railroads of the United States in the unmanufactured forms of iron and steel was on Dec. 4, as a war emergency measure, placed in the hands of a newly appointed committee of seven railroad officers, representing the Atlantic ports from Boston, Mass., to Norfolk, Va. George D. Ogden, freight traffic manager of the Pennsylvania R.R., is chairman of the committee. In exercising control of overseas traffic the committee will coöperate fully with the agents of the Allies and the U. S. Government in the effort to secure the best possible practical results in the rail transportation, from the interior to the seaboard, of export freight. Similar control was extended to all export freight, except Government freight, on Dec. 12. The committee will issue permits for freight shipments of embargoed articles only when ocean engagements with steamship agents have been perfected.

Up to Dec. 12, the committee's work was limited to administering the general embargo on export iron and steel billets, bars, plates, scrap and pig iron (except for the U. S. Government) ordered in effect on Eastern roads by the general operating committee at Pittsburgh. The necessity for such an embargo resulted from the great accumulation of the products specified, which the roads have delivered at the North Atlantic ports, and which are now stored on the ground or in cars and are immediately available for export.

The general operating committee has also decided to pool immediately all coal-carrying cars upon the roads it represents, and formally asked the special committee

on national defense of the American Railway Association that immediate authority "be secured from the proper Government representative to pool the coal-car equipment of private owners at home on the lines of the railroads represented by this committee, and establish a rate of compensation therefor." This action was based on the fact that about 80% of the coal mined in the country originates on roads represented by the committee, and that an enormous amount of shifting can be eliminated by pooling coal cars and using them interchangeably. The new organization is to be known as the Eastern Railroads Coal-Car Pool, with headquarters in Pittsburgh. F. G. Minnick will direct the traffic.

Steel and Copper Men Meet To Review Prices

Representatives of the steel and copper industries were invited to hold conferences with the War Industries Board, according to an announcement by the Council of National Defense, the steel men on Monday, Dec. 10, and the copper men on Friday, Dec. 14, to review the prices for their products agreed upon through previous conferences between the board and the industries. At the time the agreement on the prices now prevailing was made, it was understood that in the case of copper the price determined upon would be subject to possible revision at the expiration of four months, and in the case of steel that prices would be reconsidered for possible revision prior to Jan. 1. The conferences are to be for the purpose of carrying out this understanding.

Has Hoover Popular Support?

"Don't shoot the performer; he's doing the best he can." That venerable jest summarizes fairly well the popular attitude toward Mr. Hoover and his assistants in the gigantic task of regulating and conserving the food supply. What criticism of him does appear would seem to be, for the most part, due to a misconception of the purposes of food control and misunderstanding as to the powers and authority given by Congress, observes the *New York Tribune*. In a review of newspaper criticism throughout the country on the subject of food control, in an attempt to summarize the popular attitude toward Food Administrator Herbert C. Hoover, the *Tribune* further says:

"It seems obvious that prices must be high because of great actual shortage of supplies and because of abnormal war demand which neither Mr. Hoover nor any one else can control. The approval of his efforts far outweighs any dissatisfaction. As to sugar, for example, the *Boston Transcript* pertinently asked what the situation would have been, as to prices and supply, if food control had not existed. There is a very general disposition to credit Mr. Hoover with a fair measure of success, and to realize the tremendous difficulties of his job. It is patiently pointed out that the purpose of the food administration is not primarily to reduce prices, but to conserve the supply and to make the best possible distribution of it, both for export and for home consumption. Moreover, the powers given by Congress fall very far short of creating a food dictatorship. Mr. Hoover cannot directly reach the profiteering retailer, still less can he restrain the careless or extravagant individual consumer. Nor can he adequately control all the transportation systems—and that would seen to be the vitally weak spot in the whole situation. The *New York Herald* expressed this point succinctly when it said: 'One sometimes wonders why it is that complainants against high food prices always take a fling at the Food Administrator and pay no attention to Senator "Jim" Reed and his fellow statesmen who prevented Congress giving to the Food Administrator the power which the critics take him to task for not exercising.'

"It is a large contract. Mr. Hoover himself is reported to have said that no food controller 'could last six months,' but judging from the general support of the press, he still seems to have almost unanimous support, in so far as his plans are really understood. The pinch of actual want, it is promised, will eventually convince every one. Meanwhile, Mr. Hoover is trying to make people realize the facts in time to minimize the coming shortage in foodstuffs."

War Trade Board Issues Blacklist of Latin-American Firms

By order of the War Trade Board American merchants are now barred from trading with over 1600 firms in Central and South America except by special license. This blacklist, by more than 50%, duplicates the names of Latin-American firms given in the British blacklist. The entire British list, for all countries, now includes 6000 or more names. Unlike the American list, it prohibits absolutely trading with enemy firms, whereas the American list is a warning against these firms, the Trading-with-the-Enemy Law of the United States not empowering prohibition. The first American list, however, constitutes evidence, it is asserted, that firms mentioned are enemy houses or have enemy connections. There are said to be few, if any, mistakes in the list.

Central and South America were dealt with first because, the board announced, a large number of firms in the southern republics have been actively aiding Germany's cause and financing German propaganda in the United States. All those named are charged with secretly or openly assisting America's enemies. The board is now preparing a classification of non-enemy firms in Latin-America to serve American merchants who are now cut off from trade with the blacklisted firms. The board in preparing this list will minimize as far as possible inconvenience to American merchants. Care will be taken to determine that those named are not acting as agents for firms blacklisted.

Austrian Subjects Must Now Register as Enemy Aliens

Before the declaration that a state of war exists between the United States and Austria-Hungary the Department of Justice began to plan the arrest throughout the country of scores of Austro-Hungarian subjects suspected of being enemy agents. Many of these men have been under surveillance for months, but lack of definite evidence prevented their internment. With the adoption of the war resolution, many Austrian subjects in the United States automatically became enemy aliens, amenable to the President's order requiring registration of aliens and restricting their activities.

The Department of Justice expects to put alien registration into effect within a few days, and apply it at first only to Eastern cities, where the police will conduct registration. The task will be three times greater than when planned for Germans alone. The Department realizes that many Austrian subjects, particularly Bohemians and the Slavic elements, are actually pro-Ally. According to statistics of 1910 the population of the Dual Monarchy consisted of eight distinct racial groups in the following proportion: Germans, 12,000,000; Magyars, 10,000,000; Czechoslovaks, 8,500,000; South Slavs, 5,000,000; Poles, 5,000,000; Little Russians, 4,000,000; Rumanians, 3,250,000; Italians, 800,000. Only two of these groups, the Germans and the Magyars, are said to be in sympathy with the Central Powers. The 1910 census in the United States showed 1,670,502 Austrians and Hungarians in the country. Census officials estimate that there are now 2,000,000 here.

The Alien Property Custodian, A. Mitchell Palmer, has announced that property of nationals of Austria-Hungary will be safe from seizure. In his statement Mr. Palmer said: "Under the Trading with the Enemy Act the test of enemy character is one of residence and not nationality. The Alien Property Custodian will take into his possession only the property in this country held for, or on account of, or for the benefit of persons who are actually resident within the enemy territory."

Federal Operation of Railroads if They May Not Consolidate

Government operation of railroads for the duration of the war if unification of the transportation systems is not permitted by Congress has been recommended by the Interstate Commerce Commission. As an alternative to this, the commission recommended an increase in rates, Government loans and the suspension of the anti-trust and anti-pooling laws, as far as the railroads are concerned, for the duration of the war, to enable them to effect a unification in a lawful way. After reviewing the extraordinary demand on the railroads during the past year and the increases in labor and material costs, the commission's special report says:

The act to regulate commerce was not enacted to meet such a situation. The carriers have the right to demand at our hands, and it is our duty to approve, just and reasonable rates sufficient to yield fair returns upon the value of the property devoted to public use after necessary expenditures. Measured in dollars, the gross revenues of the carriers during the past and current fiscal years exceeded any in their history. But what the dollar will buy in labor, material and supplies is substantially less.

We are sensible of the vital and imperative need of the hour that our railroads shall not be permitted to become less efficient or less sufficient. We realize the gravity of a serious breakdown of our transportation facilities. It is unthinkable that this breakdown would be permitted if it could be prevented. Increased charges for carriage, if found necessary to take care of unavoidable increases in operating expenses, would not at this time bring new capital on reasonable terms in important sums.

In our opinion, the situation does not permit of temporizing. All energies must be devoted to bringing the war to a successful conclusion, and to that end it is necessary that our transportation systems be placed and kept on the plane of highest efficiency. This can only be secured through unification of their operation during the period of the war.

If the unification is to be effected by the carriers, they should be enabled to effect it in a lawful way. To that end, in our judgment, the operation of the anti-trust laws, except in respect of consolidations or mergers of parallel and competing lines, as applied to rail and water carriers subject to the act to regulate commerce and of the anti-pooling provision of Sec. 5 of that act, should be suspended during the period of the war and until further action by Congress.

In addition they should be provided from the Government treasury with financial assistance in the form of loans or advances for capital purposes in such amounts, on such considerations and under such provision of expenditure as may be determined by appropriate authority.

As a necessary concomitant, the regulation of security issues of common carriers engaged in interstate commerce should be vested in some appropriate body, as has been recommended in our annual reports. The rights of shippers for reasonable rates and nondiscriminatory service under the present jurisdiction of the commission need not be seriously interfered with by such unified control. Some elastic provision for establishment of new routes would probably be needed.

If the other alternative be adopted and the President operates the railroads as a unit during the period of the war, there should be, in our opinion, suitable guarantee to each carrier of an adequate annual return for use of the property as well as of its upkeep and maintenance during operation, with provision for fair terms on which improvements and betterments made by the President during the period of his operation could be paid for by the carrier upon return to it of the property after expiration of that period.

Billion Dollar Budget for Engineering in 1919 Fiscal Year

Engineer operations, including the equipment of the corps, and railroad and other construction for the expeditionary force in France will cost nearly a billion dollars in 1919. The exact estimate, made public on Dec. 4 in the annual report of Major Gen. William Black, Chief of Engineers, is $892,000,000, and is based on providing 1,500,000 men for engineer operations.

Equipment of the engineers is estimated at $135,000,000. For this work this year Congress appropriated $1,174,000 but a deficiency of $12,100,000 was incurred in outfitting the 10 special railway regiments alone. Congress provided $94,500,000 for engineer operations this year, but deficiency items totaling $186,000,000 have been submitted, the report says, "for construction work to be accomplished by the force in France." The report shows that equipment for 70 divisions, or approximately 1,000,000 men, was purchased within 350 hours after the declaration of war, including 8,700,000 articles, among them four miles of pontoon bridges. Every unit sent to France took its full engineer equipment with it.

Arthur Koppel First German Company To Be Licensed

The first license allowing a German-owned concern to continue business under the supervision of the Alien Property Custodian was granted on Dec. 6 by the War Trade Board to the Orenstein-Arthur Koppel Co., Koppel, Penn. A. Mitchell Palmer, Alien Property Custodian, appointed T. Hart Given, president of the Farmers' Deposit National Bank of Pittsburgh, as his representative to direct the company's operations. The company, which is owned by German capital, is engaged in the manufacture of industrial-transportation equipment.

Coal Production of French Mines was 2,800,000 tons in October, according to a statement attributed to the French Minister of Armaments and Mines by *Courier des Etats Unis*. Coal is also being imported from England in large quantities, so that a total of 3,700,000 tons will be available for distribution. Beginning with December the supply for home consumption will be increased by 100,000 tons a month, according to expectations.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Ask Higher Freights on Minerals

Application has been made to the Interstate Commerce Commission by carriers to increase rates on sulphur from Sulphur, La., to various points in the North and East as well as to certain Canadian points. Revision of rates on ferromanganese, ferrosilicon, spiegel iron and on chrome, magnesite and manganese ores has been asked by Southern carriers.

No Platinum in Adirondacks

Efforts are being made to interest investors in the "platinum" sands of the Adirondack Mountains. Dr. J. M. Clarke, state geologist of New York, has advised the National Research Council that the platinum story is a "chestnut, which has grown exceedingly unpalatable with the years." While it is true that traces of platinum have been found in the sands of northern New York, sufficient evidence has been collected to lead to the conviction that there is not the slighest possibility of working these sands commercially. Dr. Clarke said further, "Philadelphia has been the hotbed of some of the worst propaganda regarding gold and silver in New York that this country has known, and I am speaking within limitations in saying that millions of dollars have been wasted upon investment projects in New York, floated by crooked companies claiming to carry on their demonstrations right under the eye of the intending investor. The story of these 'gold crazes,—one after another, first on the east side of the Adirondacks, then on the west side; at present in Herkimer and St. Lawrence Counties, while the Lewis County craze is not even yet dead—is a perfectly wicked one . . . . I have on my files the whole history of the transactions—sworn affidavits and confessions of copartners in these gold and platinum propaganda—and I have been going through this thing for the last 30 years, so I am speaking with some knowledge."

Commissions in Mining Regiment Sought by Many

Requests in large numbers are reaching the War Department for officers' commissions in the special mining regiment. It is stated officially that no commissions will be granted in this manner. Maj. O. B. Perry, who is directing the formation of the regiment, already has a list of more than 40 mining engineers who have secured commissions after their merit was thoroughly demonstrated in the regular officers' training camps. Many other names probably will be added to this list, which is expected to be more than adequate to furnish officers for the units to be formed before there is an opportunity to select those best qualified from the ranks. As enlistments in the mining regiment may be made at any recruiting station, there is no way of obtaining promptly information as to just how many men have enlisted. Recruits for the regiment, however, are reaching Camp Meade at the rate of 20 a day. At present acquisitions to the regiment of quarrymen are greater than those to the mining regiment, which is attributed to the fact, that many quarries close down in winter.

Work of Administering Explosives Act Now Well Under Way

Operators from the Pittsburgh district decided upon a magazine basis for issuing explosives, after several conferences with officials of the U. S. Bureau of Mines with regard to the interpretation of the Explosives Act. In this way all explosives will be issued to Austrian and other workmen through licensed foremen.

Nearly 2500 persons have been vested with the power to issue licenses. Such appointments have been made in all of the important mining districts. The number in each county ranges from one to 20, according to local needs and may be greatly increased if necessary.

The preliminary organization for supervising the work was effected by L. E. Young, of the University of Illinois, one of the Bureau's consulting engineers. This having been done, Francis S. Peabody, the assistant charged with the administration of the act, placed D. D. Bush in direct charge of the permanent organization. Mr. Peabody has called in several volunteers to assist him. They are D. S. Boynton, of the By-Products Coke Corporation, of Chicago; W. H. Glasgow, of the H. C. Frick Coke Co.; Daniel Baker, Jr., of the Standard Lime and Stone Co., and E. A. Orem, of the DuPont Company.

Inspectors to enforce the Explosives Act have been appointed in 43 states. The appointments were approved by the President on Nov. 26. The selections were made largely upon the endorsement of each state's senators. The following appointees have been instructed to report to Van. H. Manning, director of the U. S. Bureau of Mines:

Edward L. Shaw, Phoenix, Ariz.; D. C. Sargent, Cordova, Alaska; Edwin T. Reaves, Little Rock, Ark.; Walter K. McAdory, Birmingham, Ala.; John M. Griffin, Madera, Calif.; Thomas S. Price, Longmont, Colo.; James E. McGann, New Haven, Conn.; Clarence E. Woods, Eustis, Fla.; Carlos H. Mason, Atlanta, Ga.; Lemuel T. Osborn, Mount Vernon, Ind.; John J. Hughes, Council Bluffs, Iowa; Edgar S. Elder, St. Maries, Idaho; William A. Compton, McComb, Ill.; Thomas S. Rhea, Russellville, Ky.; Isaac A. Broussard, Breaux, La.; Madison C. Bowler, Minneapolis, Minn.; Daniel F. O'Connell, Fitchburg, Mass.; Ellis S. Middleton, Pocahontas, Miss.; Albert E. Stevenson, Port Huron, Mich.; Walter L. Lampkin, Kansas City, Mo.; Jeremiah W. Farrell, Joliet, Mont.; Leon O. Tebbetts, Waterville, Maine; Edward D. Jackson, Buffalo, N. Y.; Nicholas Hughes, Paterson, N. J.; Andrew W. Bingham, Littleton, N. H.; William P. Porterfield, Fargo, N. D.; Charles F. Clark, David City, Neb.; Daniel A. McDonald, Carthage, N. C.; William N. Campbell, Medford, Ore.; Jasper S. Kinslow, Columbus, Ohio; Fred Rains, Muskogee, Okla.; John W. Rittenhouse, Scranton, Penn.; Francis E. Sullivan, Providence, R. I.; Charles B. Watters, San Antonio, Tex.; Albert M. Leach, Clarksville, Tenn.; David C. Dunbar, Salt Lake City, Utah; Park H. Pollard, Proctorsville, Vt.; Martin Williams, Pearisburg, Va.; Walter G. Ronald, Seattle, Wash.; E. M. Gilkeson, Parkersburg, W. Va.; James A. Berry, Basin, Wyo.; and William Banks, Columbia, S. C.

Editorials

The Taxation Question Again

CONGRESS has reassembled in a different frame of mind. Its members have been among their constituents and have learned that they had no high opinion of the Congressional efforts, during weary months, in drawing a war-tax measure. This is putting it mildly. It would not be stretching the truth to say that the members of Congress found their constituents disgusted with them. Nor was this a futile Wall Street disgust, but rather the ire of the mountains, the prairies and the forests. The West was vociferous and its howl was heard. Therefore Congress returns chastened in spirit and pathetically making excuses for itself.

One leader says apologetically that this was a piece of pioneering legislation, wherefore mistakes were bound to be made, but of course would be corrected. He overlooked that intelligent citizens would tell him that there was no need to do pioneering in fields that Great Britain had already explored, concerning which economists, financiers and the press gave clear advice during the debates. Senator Simmons preposterously says that Congress was guided by the Treasury Department, wherefore the faults of the law ought not to be charged to Congress, although how he can say such a thing with a straight face we do not know, unless politicians lack the common sense of humor.

Everybody knows, as Professor Taussig, of the Tariff Board, says, that after Congress had discussed the revenue bill for six months it was redrawn in a fortnight by "a group of eight men, already wearied by a trying session and now compelled to work under high pressure," and their draft was enacted by Congress after a day or two of perfunctory debate. The conference committee had tried to compromise between two antagonistic and irreconcilable principles—one being the simple taxation of war profits as proposed by the Senate and the other the taxation of the profits of capital in excess of a given percentage—and naturally produced a hodge-podge. Senator Smoot is now outspoken in saying:

> What the country needs and is going to demand is a revenue law that will clearly define precisely what taxes are to be exacted. Nothing more grotesque has ever been passed by Congress than the excess-profits tax in the War Revenue Law. Not one corporation in the country is exactly sure how the tax is to be applied. And the Treasury is unable to give any interpretation that helps them.
>
> Congress ought not hesitate under this situation to repeal the entire law, and, along with it, the revenue law of 1916, which puts surtaxes on incomes of individuals and corporations beyond those already existing. The whole problem of taxing corporations and individuals has been hopelessly muddled, and Congress might as well get down to facts and pass legislation that will remedy the difficulty.
>
> We need a revenue law written in the simplest language and in half the words used in the War Revenue Law. We want a law that will show individuals and corporations exactly what they have to pay. It is not that corporations kick against paying a war tax, but that they do not know what they are required to pay that has made the War Revenue Law useless.
>
> Out of the chaos that now prevails over the War Revenue Law, Congress can, with little delay, frame a bill that will meet all the requirements, yielding as much revenue, putting a heavy tax on excess war profits, and maintaining, as far as is desirable, all the virtues of the present measure.

We agree fully with Senator Smoot in principle, but we are not sure that an absolute repeal of the present law will be advisable, lest we might get something worse. If there were a scientific reframing of this great revenue measure there should be as heavy taxation of war profits as was contemplated in the present measure, but no heavier; an easing of the present burden on capital that is not realizing war profits; and the raising of more money by consumption taxes, allowing for the checking of consumption of those things that it is desirable to check. But Congress has heretofore exhibited a great aversion to consumption taxes. Recognizing that and not hoping for a change of mind, the present law has many good features that might best not be exposed to further tinkering, and the repeal may well be confined to the war-profits section.

In that there ought certainly to be a removal of the iniquitous 8% additional tax on earned incomes of individuals and partnerships, a sweeping away of the second-class postal rate atrocity, and an explicit provision of how the war profits of corporations are to be taxed.

With respect to the last matter, mining companies were badly hit by the present law, and many of them inequitably and unjustly. The American Mining Congress recently filed an interesting brief on this subject with the Bureau of Internal Revenue, and the porphyry copper companies have also filed a brief, very illuminating, that we are publishing in this issue. Both of these briefs introduce some novel points for discussion and suggest proper amendments of the present law. However, the return of Congress in its present frame of mind has rather taken the wind out of the sails of this movement. If it were to be merely a matter of correcting the present law, suggestions would be in order. But if there develop a strong movement to repeal the whole thing and substitute a different principle, such as that of the original Senate bill, the definitions of capital and earned surplus might cease to be matters of interest. As to this we must wait and see.

Curtailment of Lead Consumption

THE report of the U. S. Geological Survey showing that the production of white lead in 1916 was only 129,000 tons, compared with 156,000 tons in 1915, illustrates the remarkable extent to which the consumption of lead pigment was curtailed by the higher price for pig lead.

In 1916 pig lead averaged 6.858c. per lb. at New York, against 4.628c. in 1915. In 1915 dry white lead opened at 5c., advanced to 7⅜c. about the middle of the year, and closed at 6¼c. In 1916 the price advanced steadily up to Mar. 17, when it was fixed at 8⅜c., where it remained during the rest of the year. In June, 1917, it rose to 11½c., but subsequently was reduced to 9c.

The statistics for 1917, when they are available, will probably show that there was a further contraction in the consumption of lead for painting. That this contraction has not been due to the headway gained by other white pigments at the expense of lead is shown from the fact that the combined production of sublimed lead, zinc oxide and leaded zinc oxide was 135,606 tons in 1916, against 141,383 tons in 1915. Lithopone, which is used for special purposes, was the only white pigment to show an increase in 1916; the output of this having been 51,291 short tons, as compared with 46,494 in the previous year.

Verily, the law of supply and demand does operate, even under the conditions of world-wide war.

The Federal Trade Commission

THE Federal Trade Commission is still studying the cost of production of metals and minerals. It does not matter to it that it was publicly discredited respecting its diagnosis of the cost of producing coal, or that it was privately recognized that its opinions respecting the cost of producing copper exhibited pitiable misunderstanding. Its "experts" still haunt the offices of metallurgical companies, without bothering anybody except the accountants, who throw up their hands in despair. They might as well explain things to the sparrows that chatter outside the windows. After one flock of "experts" has disappeared another one comes.

About the time they are ready to report, conditions will have changed so that cost of production may be very different from what it was previously. This will give the "experts" an opportunity to begin all over again. For the endless job that so satisfies the soul of the bureaucrat these have found the ideal way of keeping busy.

But how about winning the war? We have heard that in the Army and Navy and other working departments there is a dearth of clerks and typists. Why do not they commandeer them from the Federal Trade Commission? Moreover, if the offices of this commission were vacated there would thus become available a good many rooms that also are much needed in Washington.

The Institution of Mining and Metallurgy

THE Institution of Mining and Metallurgy has just issued what is at the same time a glorious and a sorrowful bulletin. It is devoted to a list of the members serving with His Majesty's forces, according to information up to Oct. 20, 1917; but the names of members who have served and who have been invalided out of the forces are not included in the list. Even with such exclusion, it appears that out of members, associates and students numbering 2374, according to the Institution's list of March, 1916, there are enrolled 682 as being now in service. This is the glorious part of the record. It is something wherein the Institution of Mining and Metallurgy, and Great Britain and the Colonies may feel the deepest pride. To have nearly one-third of the membership of such an organization in military service! The sorrowful part is that since the beginning of the war, 78 of its members, associates and students have been killed or have died of wounds. The honor roll of the Institution of Mining and Metallurgy is a bright one.

The members of the Institution are giving a remarkably good account of themselves in high-explosive factory production and management, in aëroplane work, in the conservation and increasing of mineral supplies, including petroleum; in defeating the submarine menace, in artillery service, and in tunneling operations at the front. It is said that the Institution has supplied upward of 200 officers to the corps of sappers and miners.

Will America Learn To Be Thrifty?

"I SUPPOSE not many fortunate by-products can come of a war," said President Wilson, Nov. 16, "but if this country can learn something about saving out of the war, it will be worth the cost of the war; I mean the literal cost of it in money and resources."

American people have been notoriously the most wasteful of all civilized peoples. For many years thrift has been preached but it has not been practiced. Necessity may now effect what advice would not. We believe that the President is correct; that we can save enough in a relatively few years to pay the cost of the war, enormous though it be, and after that the nation may become richer than ever.

Interesting reports come from certain of the coal and iron regions, especially in the vicinity of Pittsburgh, operators stating that they observe a better performance of work per man than was recently the case. The improvement is attributed largely to the men having bought Liberty bonds on the installment plan. Men who formerly worked only enough to meet their living requirements have been stimulated to earn more money in order to meet what is due on the bonds for which they have subscribed. If such a stimulus should become general among workers in all parts of the country, the results would be marvelous.

Copper After the War

NORMAN HAPGOOD, whose letters from London and Paris, have been a feature in the *Evening Post*, refers in a recent communication to discussions among French experts respecting industrial regeneration after the war. They put the greatest emphasis upon the development of French iron-ore and water-power resources. Mr. Hapgood wrote as follows:

> Germany, thus troubled by the future, looks critically at the resources of France, whose strength she had planned to shatter. A German expert estimates that France contains three and a third times as much iron as Germany, although the great beds of Normandy are not yet fully developed. The German seizure of the iron manufacturing region of northern France would have ended the war and allowed Germany to annex that whole region had not England sent to France the steel that enabled her to hold out; and it has been freely admitted in Germany that she could not have long continued the war without the seizure of this region.
>
> Germany, weak in iron, contains on the other hand far more coal than France, and there is a German proverb that says "iron runs toward coal." In other words, great metal works tend to be developed less in iron districts than in coal districts. Hence part of the bitterness of the fighting about the Franco-Germany boundary, with its immense coal implications. Thus here again we come around to the hero of this article, water power. If France is rich in iron and poor in real coal, we see still more clearly how her industrial future depends on the development of her white coal.

That there will be a greatly increased use of hydro-electric power immediately after the war, not only in

France but also in every civilized country that possesses water falls, is a plausible forecast. The shortage of labor wherefrom we now suffer is bound to continue and the deficiency must be offset by increased mechanicalization. Electrification, taking the place of thousands of coal miners and of railway cars, is one of the major ways in which that may be done. Therefore we may reasonably expect that it will be done. But electrification means the use of copper, which is of interest to the producer of copper.

BY THE WAY

The *Journal* acknowledges receipt of a copy of the house organ of Arthur D. Little, Inc., chemical engineers and managers, of Cambridge, Mass. It is felicitously named *The Little Journal* and discusses in an interesting manner many subjects of importance to chemical engineers, the mining industry and the public.

The following comes from Bisbee: A big raw-boned Texas cowpuncher applied for work at the C. & H. and was given a job as mucker on the 1800 level at the Junction mine. During his first morning out he came across a long black spit-fuse in the muck pile. After carefully sizing it up, he was heard to remark, "My Gawd, I never 'spected to find roots so deep in the earth as this."

Robert Safford Towne, who died on Aug. 3, 1916, left an estate that has just been appraised at $2,419,991. Mr. Towne was in later years mainly engaged in mining in Mexico. Besides his numerous mining enterprises, such as Cia. Metalurgica Mexicana, Teziutlan Copper, Fresnillo Mines, and the San Luis Potosi smeltery, he was president of the Mexican Northern Ry.

The concluding remarks of H. W. Garrod, of the British special labor mission, in summing up his observations of labor conditions in this country, are very much to the point if we are going to bring this war to a successful close. He said: "I will just add one other word, if I may, which I hope won't be taken as being anything in the nature of advice or criticism. Since we have been in this country, a period now of nearly 10 weeks, we have been witnesses from a distance of a very considerable number of trade disputes which have been, so far as we could judge, serious, and in some cases, prolonged. But what I want to say is that if one-eighth—I think that is no exaggeration—of the industrial troubles which we have witnessed in this country in the last two months had taken place in England, over the whole period of the last two years, we should long ago have been compelled in England to sue for disgraceful peace. That, I think, gentlemen, is a serious and solemnizing reflection, and I want to leave it to you without comment."

The identification tag worn by every man on Uncle Sam's warships is made of monel metal, an alloy into which nickel and copper both enter. "Monel metal," continues the *Unscientific American*, "is obtained in Colorado and is furnished to the United States by several firms." As a matter of fact, it may be mentioned that monel metal is the natural alloy obtained in the reduction of the Sudbury, Ont., copper-nickel ore and is produced at the Orford Copper Co.'s (International Nickel) works on Constable Hook in New York Harbor. Aside from these facts, what our contemporary has to say may be true and is interesting. "The distinguishing characteristics of monel metal, as far as its use in these identification tags is concerned, are its high melting point—3840° F.—and the fact that it is unaffected by the corrosive action of sea water. The metal tags are small, measuring in oval shape 1¼ by 1½ in. They are perforated at one end, so that they can be suspended from the neck by a wire braid, also of monel metal, which, in turn, is incased in a cotton covering. On one side of these tags, when finished, appear the name and initials of the owner, the month, day and year of enlistment and month, day and year of birth. 'U. S. N.' is added, and when the owner is an officer his rank and date of appointment. On the other side appears his 'natural signature'—that is, a print from his right index finger. These marks and letters are in raised metal, and are indestructible, except by such means as a file or hammering."

America's war aim is now "disclosed" by the *Vossische Zeitung* of Berlin. It is alleged to be the acquisition of Alsace-Lorraine's potash deposits. The correspondent to the *New York Times* at the Hague on Nov. 25 cabled the substance of an editorial in the Berlin paper which "admits that the iron-ore districts of Diedenhofen, with that of Briey-Longwy-Nancy-Calvados, would make France the richest iron country in Europe, but insists that the potash deposits between Mülhausen and Zinheim are the question of the hour." It is unnecessary, says the paper, to cite Germany's unwillingness to give up one square yard of the German Lorraine iron-ore districts, as these are imperative for Germany, industrially and agriculturally. The Alsace potash deposits, it proceeds to say, represent another economic phase of the situation, and many persons are ignorant of the fact that whereas coal and iron are the basis for industrial development potash is the "third trump" after the war. The paper asserts that, while the American troops are now on a 'quiet part of the front,' it is to be expected that they will soon be moved to Sundgau, on the Rhine-Rhone canal, in order to claim the potash deposits at present in German hands. It is alleged that Americans are even capitalizing a scheme for enlarging the canal from Mülhausen to Marseilles in order to facilitate the transportation of potash to that port, and that immediately after the conclusion of peace some German potash deposits are to be claimed as natural compensation owing to the fact that the French works have been destroyed by fire. But, it says, "Nothing must be given away, and only step by step shall we deliver potash to neutrals and, after the war, to enemies. But neutrals and enemies will need increasing quantities of potash at the conclusion of peace, as the soil becomes poor. Grain crops have almost disappeared, Australia excepted, and cotton crops have greatly decreased. If they refuse us raw materials we will revenge ourselves on the enemy's agriculture." The paper concludes with a warning that, to achieve this aim, Germany's potash monopoly must remain intact.

U. S. Mineral Production in 1915 and 1916

Production of minerals in the United States for 1915 and 1916 has been tabulated by the U. S. Geological Survey as shown herewith, the figures being subject to final revision. The value of the production in 1916 was $3,515,339,409, comparing with $2,397,335,050 in 1915. This, of course, may not represent so great an increase in actual quantity, owing to the fluctuation and generally advancing price of many of the minerals, and attention is directed to the fact that a complete record of mineral production of 1916 has not been possible. The value of the nonmetallic products reported in 1916 was $1,878,507,232 and of the metallic products $1,621,832,177, the remaining $15,000,000 being unspecified.

U. S. MINERAL OUTPUT, 1915 AND 1916

Product	1915 Quantity	1916 Quantity
Metallic:		
Aluminum, (dollars)	16,280,000	33,900,000
Antimonial lead, short tons	23,224	24,038
Antimony, short tons (2,000 pounds)	5,364	(a)
Bauxite, long tons (2,240 pounds)	297,041	425,100
Cadmium, pounds	91,415	135,212
Chromic iron ore, long tons	3,281	47,035
Copper, pounds	1,388,009,527	1,927,850,548
Ferroalloys, long tons	388,644	589,738
Gold, troy ounces	4,887,604	4,479,056
Iron:		
Ore, long tons	55,493,100	77,870,553
Pig, long tons	30,384,486	39,126,324
Lead (refined), short tons	507,026	552,228
Manganese ore, long tons	8,708	26,997
Manganiferous ore, long tons	196,640	548,803
Nickel, short tons	822	918
Platinum and allied metals, troy ounces	8,665	28,088
Quicksilver, flasks (75 pounds net)	21,033	29,932
Silver, troy ounces	74,961,075	74,414,802
Tin (metallic equivalent), pounds	204,000	278,000
Titanium ore (rutile), short tons	250	(b)
Tungsten ore (60 per cent. concentrates), short tons	2,332	5,200
Uranium and vanadium minerals (dollars)	693,750	(d)
Zinc, short tons	458,135	563,451
Nonmetallic:		
Arsenious oxide, short tons	5,498	5,986
Asbestos, short tons	1,731	1,479
Asphalt, short tons	740,254	786,811
Barytes (crude), short tons	108,547	221,952
Borax (crude), short tons	67,003	103,525
Bromine, pounds	855,857	688,260
Calcium chloride, short tons	20,535	26,062
Cement, barrels (380 pounds net)	87,685,222	95,394,433
Clay:		
Products (dollars)	163,120,232	207,260,091
Raw, short tons	2,362,954	2,932,590
Coal:		
Bituminous, short tons	442,624,426	502,519,682
Pennsylvania anthracite, long tons	79,459,876	78,195,083
Coke, short tons	41,581,150	54,533,585
Diatomaceous (infusorial) earth and tripoli (dollars)	167,474	241,553
Emery, short tons	3,063	15,282
Feldspar, short tons	105,118	132,681
Fluospar, short tons	136,941	155,735
Fuller's earth, short tons	47,901	67,822
Garnet for abrasive purposes, short tons	4,301	6,171
Gems and precious stones (dollars)	170,431	217,793
Graphite:		
Amorphous, short tons	1,181	2,622
Crystalline, pounds	7,074,370	10,931,989
Grindstones and pulpstones (dollars)	648,479	766,140
Gypsum, short tons	2,447,611	2,757,730
Lime, short tons	3,622,810	4,083,803
Magnesite (crude), short tons	30,499	154,974
Mica:		
Scrap, short tons	3,959	4,433
Sheet, pounds	553,821	865,863
Millstones (dollars)	52,480	44,559
Mineral paints:		
Natural pigments, short tons	57,442	(c)
Zinc and lead pigments, short tons	141,383	135,606
Mineral waters, gallons sold	52,113,503	55,928,461
Natural gas (dollars)	101,312,381	120,227,468
Natural-gas gasoline, gallons	65,364,665	103,492,689
Oilstones, etc. (dollars)	115,175	154,573
Peat (dollars)	288,537	369,104
Petroleum, barrels (42 gallons)	281,104,104	300,767,158
Phosphate rock, long tons	1,835,667	1,982,385
Potash (K_2O), short tons	(d)	9,720
Pumice, short tons	27,708	33,320
Pyrite, long tons	394,124	423,556
Salt, short tons	5,352,409	6,362,906
Sand:		
Glass, short tons	1,884,044	2,018,317
Molding, building, etc., and gravel, short tons	74,719,259	87,073,415
Sand-lime brick (dollars)	1,135,104	1,474,073
Silica (quartz), short tons	112,575	88,514
Slate (dollars)	4,958,915	5,338,837
Stone (dollars)	74,595,352	79,041,699
Sulphur, long tons	(e)	(e)
Sulphuric acid (60° Baume) from copper and zinc smelters, short tons	(f)904,653	(f)1,069,589
Talc and soapstone (exclusive of fibrous talc), short tons	98,677	119,725
Talc, fibrous, short tons	88,214	93,236
Thorium minerals (monazite), pounds	36,000	37,872

a Figures not yet available. Estimate of value included under "Unspecified."
b Figures not yet available.
c Canvass discontinued.
d Not available.
e Not specified.
f Includes 59,189 tons in 1915 and 92,802 tons in 1916 of stronger acid, reported as oleum, etc., not converted to 60° Baume.

Budget Increased for Next Fiscal Year for Government Mining Bureaus

An increase of $100,000 for mineral mining investigations is asked of Congress. This would bring the total appropriation for this purpose to $200,000 for the coming fiscal year. This money is to be expended for the following purposes:

For inquiries and scientific and technologic investigations concerning the mining, preparation, treatment and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development and conserving resources through the prevention of waste in the mining, quarrying, metallurgical and other mineral industries; to inquire into the economic conditions affecting these industries; and including all equipment, supplies, expenses of travel and subsistence. No part of the appropriation may be used for investigation in behalf of any private party.

The increase is needed largely to cover salaries for mining and metallurgical engineers and technologists, who have been added to the staff of the U. S. Bureau of Mines to handle war work. Expenses of conducting mining-experiment stations are increased $75,000, due to the establishment of three additional stations, $225,000 being the total to be expended during the next fiscal year. The total appropriation asked for the Bureau for the next fiscal year is $1,984,377, that for the current year being $1,071,820. A much greater sum, however, is being expended by it, due to the war work it is conducting for other departments, which furnish the necessary funds from their own appropriations.

Estimates of the amount needed to maintain the U. S. Geological Survey during the coming fiscal year are $1,720,520, which is $170,000 greater than for the current year. An additional $20,000 is asked for research to determine geological conditions favorable to the presence of potash, bringing the total for this work to $60,000. The remainder of the increase includes $50,000 for geological surveys, $50,000 for mineral resource work and $50,000 for land classification.

Engineers To Raise New Regiment

The American Society of Mechanical Engineers will recruit a regiment of 2000 engineers for service with the American expeditionary forces in France, according to an announcement by Calvin W. Rice, secretary, at the Society's 38th Annual Convention held in New York last week. Mr. Rice said that the regiment which the society recruited at the beginning of the war, 1160 strong, and sent to Europe had more than taken its share in the honors which American engineers were receiving abroad. He said that in the present crisis it was felt that the mechanical engineers should not be backward in coming to the aid of the Government, and he asked for a $10,000 fund from the society to meet the expenses of enlisting the regiment. It would cost

$5 a man, he said, to recruit the regiment. This would pay for clerical work, offices, and advertising. Recruiting offices will be opened soon in the Engineering Societies Bldg., 29 W. 39th St. Liberal responses were made to the appeal for funds.

Gano Dunn, chairman of the engineering committee of the Council of National Defense, described how more than 30,000 engineers, members of the technical societies of the nation, were already serving the Government in many branches. The engineers were told by Major B. C. Detchow, of the Ordnance Department of the U. S. Army, that they must help the Government immediately to supply a thousand trained workmen for employment behind the lines in France. He described the need and importance of quick action. These men, he said, must be outside the draft age, or else in the third and fourth classes of the draft. They would be utilized in machine shops, in repair work on "tanks" and tractors and on the mechanism of the giant guns. This was the first time, he said, that the Government had issued such a call, and he asserted there must be no delay; that unless skilled civilians were obtained the Government would be forced to recall some of its fighting men.

Bill for International Action on Silver

WASHINGTON CORRESPONDENCE

Senator Shafroth has introduced the following joint resolution, which has been referred to the Committee on Banking and Currency:

Whereas, The settlement of balances of trade with silver-using countries threatens the depletion of our stock of gold, although such countries prefer that such balances should be paid in silver; and

Whereas, To relieve such condition it is necessary that the production of silver be increased; and

Whereas, The enormous expansion in world credits during the past three years necessitates the enlargement of the base upon which such credits are founded; therefore, be it

Resolved, That the President be authorized to appoint a commission of three members to visit our allied and the neutral nations of the world, with a view of making an international agreement as to the coinage of silver, subject to approval by Congress; and that the sum of $100,000, or so much thereof as may be necessary, be and the same is hereby appropriated out of any money in the Treasury not otherwise appropriated, to pay the expenses and compensation of such commission.

Supreme Court Upholds "Open Shop"

On Dec. 10 the Supreme Court of the United States rendered a decision defining in general terms the rights of labor and of employers. In the case of the Hitchman Coal and Coke Co. vs. the United Mine Workers of America the company was upheld in an injunction restraining the union from enlisting members from its employees The company was working under the "open-shop" system and had entered into an agreement with its employees that no union men should be employed. The Supreme Court upheld the right of the company to enjoy the resulting status of conditions and confirmed the injunction of Judge A. G. Dayton against the conspiracy for recognition of the union.

Copper Sulphate or blue vitriol is largely used in Italy for treatment of grape vines, says *Commerce Reports*. Although produced in Italy, some quantities are also imported, the United States having supplied 123 tons and Great Britain 25 tons during the first quarter of this year.

Comfort Fund for 27th Engineers

If the rush to subscribe to the Comfort Fund for the 27th Engineers equals that to enlist in the regiment itself, there will be no lack of smokes and other life-savers for the men between here and the Rhine. From Washington we are told that requests for commissions are being received in large numbers and that a steady stream of recruits is pouring into Camp Meade from points all over the country. About 200 letters a day showing keen interest in the movement are being received by Maj. O. B. Perry, who is directing the formation of the regiment. Many are from men over the age limit, asking that exceptions be made in their cases to permit their enlistment. The following from William P. Daniels, of the Big Five Mining Co., of Denver, Colo., is characteristic of many:

I have your letter asking for volunteers for a mining regiment. I will promptly call the request to the attention of our own employees and of those working under leases on our property. We employ but few men, but some of our former employees now are somewhere in France and others are in training camps.

The writer on previous occasions has offered himself for anything for which he is competent. Age and a mutilated hand preclude active army service, but I am ready to answer a call in any capacity where I can be of use. I should like to have an opportunity to maintain, as best I can, the record of a family which gave five members to the Civil War, three of whom died on the battlefield.

It is in such a spirit as this that the 27th Engineers is being formed and it was to keep the men of this regiment happy that the Comfort Fund was started. The following subscriptions have been received to date:

"Engineering and Mining Journal"	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
Total	$3330.00

Mining companies need not be apprehensive about subscribing to this fund as companies lest any stockholder should consider it as an illegal disbursement. It is true, of course, that a board of directors that votes such a contribution is personally liable for it should the stockholders object, but the possibility of such an objection being made is exceedingly remote. There will be various ties to bind the men in France to home and country but we want to go further than this and link the regiment closely to the mining industry so that it will feel that it belongs to a clan that has not forgotten it. No better way of securing this personal touch can be effected by mining men collectively than by subscribing to the Comfort Fund. All contributions will be promptly reported in our columns. The officers of the regiment are to assist in administering the Fund. Send us your check drawn to the order of the *Engineering and Mining Journal*. Do it now!

NEW PUBLICATIONS

Report on the Price of Gasoline in 1915. Pp. 224; illustrated. U. S. Federal Trade Commission, Washington.

The Elements of Coal Mining. By Daniel Burns. 4½ x 7¼, pp. 236, illus. $1.10. Edward Arnold, London.

Nova Scotia: Annual Report of the Mines, 1916. Pp. 174, illus. Department of Public Works and Mines, Halifax, N. S.

The Ores of Copper, Lead, Gold and Silver. By Charles H. Fulton. Pp. 45. Technical Paper 143, U. S. Bureau of Mines, Washington.

Relief Map of the State of Oregon. By the Oregon Bureau of Mines and Geology. 36 x 28. James, Kerns & Abbott Co., Portland, Oregon.

Annual Statistical Report of the American Iron and Steel Institute, 1916. 9 x 16, pp. 102. American Iron and Steel Institute, New York.

Salitre Contribucion al Estudio de su Industria. By Nicolas Ugalde. Pp. 145; illustrated. Soc. Imprenta Litografia "Barcelona," Santiago, Chile.

Annual Report of the Department of Mines, New South Wales, for the Year 1916. Pp. 213, illus. New South Wales Dept. of Mines, Sydney, N. S. W.

The Value of Peat Fuel for the Generation of Steam. By John Blizard. Pp. 42, illus. Bulletin 17, Canada Department of Mines, Mines Branch, Ottawa.

Annual Report on the Mineral Production of Canada During the Year 1915. By John McLeish. Pp. 364. Canada Department of Mines, Mines Branch, Ottawa.

Abstracts of Current Decisions on Mines and Mining, from September to December, 1916. By J. W. Thompson. Pp. 84. Bull. 147, U. S. Bureau of Mines, Washington.

The Cretaceous Faunas of the Northeastern Part of the South Island of New Zealand. By Henry Woods. 9 x 11, pp. 42, illus. New Zealand Geological Survey, Wellington.

Geology and Economic Deposits of a Portion of Eastern Montana. By Jesse Perry Rowe and Roy Arthur Wilson. Pp. 58; illustrated. Montana State University, Missoula.

The Molybdenum Industry in New South Wales. By E. C. Andrews. Pp. 199, illus. Mineral Resources No. 24, Geological Survey, Department of Mines, Sydney, N. S. W.

Industrial Poisons Used or Produced in the Manufacture of Explosives. Alice Hamilton. Pp. 141; Bull. 219, Bureau of Labor Statistics, U. S. Department of Labor, Washington.

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The Coal Fields and Coal Industry of Eastern Canada; A General Survey and Description. By Francis W. Gray. Pp. 67, illus. Bull. 14, Canada Department of Mines, Mines Branch, Ottawa.

Geology and Water Resources of Big Smoky, Clayton and Alkali Spring Valleys, Nevada. By Oscar E. Meinzer. Pp. 167, illus. Water Supply Paper 423, U. S. Geological Survey, Washington.

Methods of the United States Steel Corporation for Commercial Sampling and Analysis of Coal, Coke and By-products. Pp. 91; illustrated. $1.50. J. B. Camp, Carnegie Building, Pittsburgh, Penn.

The Geology and Mineral Resources of the Reefton Subdivision. Westport and North Westland Divisions. By J. Henderson. Pp. 232, illus. Bull. 18 (New Series), New Zealand Geological Survey, Wellington.

Report on the Building and Ornamental Stones of Canada. Vol. IV, provinces of Manitoba, Saskatchewan and Alberta. By Wm. A. Parks. Pp. 333, illus. Canada Department of Mines, Mines Branch, Ottawa.

British Columbia: Annual Report of the Minister of Mines for the Year 1916. An account of mining operations for gold, coal, etc., in the province of British Columbia. Pp. 548, illus. Minister of Mines' Office, Victoria, B. C.

Identity of Black Rutile and Strüverite; and the Elimination and Separation of Titanium, Columbium, Tantalum and Zirconium. By William P. Headdon. Mineralogical Notes No. IV, 25 pp. Colorado Scientific Society, Denver, Colorado.

Proceedings of the Second Pan-American Scientific Congress, Washington, U. S. A., 1915-16. Vol. VII, Section VI, International Law, Public Law and Jurisprudence. Compiled and edited under the direction of Glen Levin Swiggett. 6 x 9, pp. 867. Government Printing Office, Washington.

Transvaal Chamber of Mines: Twenty-seventh Annual Report, 1916. Johannesburg, Transvaal. 7 x 9 in., pp. 440. Issued by the Chamber.

Besides the lists of officers and members this volume contains the annual statistical report of production; reports of the meetings and lists of new companies registered and of companies dissolved during the year. There are also a number of reports, including those on native labor, on taxation and special war dues, on miners' phthisis, on training schools, on wages and on encouragement of local industries. An appendix gives a list of acts relating to the mining industry passed by the South African Parliament, with an analysis of the more important laws.

Canadian Mining Manual, 1916-17; a Handbook of Information Concerning the Minerals and Mines of Canada. Edited by Reginald E. Hore. 6 x 9, pp. 448, illus. Mines Publishing Co., Toronto, Canada.

This is the third volume of the new series of the "Manual," which was originally founded by the late B. T. A. Bell, but allowed to lapse after his death, until it was revived in 1913. It gives an excellent summary of the mineral industries of Canada, with statistical reports and many notes of progress and changes made during the year. More than half the book is taken up by the alphabetical list of mining companies operating in Canada. A supplemental list gives the classification of the companies by their products, and an appendix supplies particulars as to several of the more important companies which have been organized or have begun serious work during the year.

The Mineral Industry: Its Statistics, Technology and Trade. Vol. XXV, 1916. Founded by Richard P. Rothwell. Edited by Prof. G. A. Roush. Cloth, 6 x 9, pp. 960. $10. McGraw-Hill Book Co., Inc., New York.

As stated on the title page, this volume is a supplement to Volumes I-XXIV, and it not only includes the statistics for 1916, but also gives corrections of the figures incorporated in previous volumes, presenting the latest available information on each subject treated. It has been prepared with the usual care and with the assistance of contributors especially skilled in various topics. The list of these is too long to be included here, but it includes a number of names well known both for technical and statistical ability.

The general arrangement of the book is the same as that of preceding volumes. In addition to the technical information given in the several articles, there are two special chapters, one by Prof. R. H. Richards on "Progress in Ore Dressing and Coal Washing," and a table of statistics of the "World's Principal Mines," both of which are valuable in their respective lines. A special feature of the present volume is the introduction comparing Vol. I with Vol. XXV, and showing the progress made in the production of the more important metals and minerals during the 25 years covered by the series. This is illustrated by a number of diagrams graphically depicting the changes of the quarter of a century—many of which are strikingly indicated.

It is impossible, of course, to criticize properly a book of this kind until it has had a continued test by constant use and reference. It does seem, however, as if some of the statistics might have been brought more closely up to date by a judicious use of available data. This is especially the case with "Gold and Silver" and with "Iron and Steel." Some estimates which could well have been closely made would have improved the value of both of these articles to the reader who has occasion to refer to them.

That a work of this kind should be able to hold its own and maintain itself for 25 successive years without any great organization to support it is, perhaps, sufficient proof that it has its place in the mining and mineral world. It may be taken now as well established and generally considered a useful and reliable compilation.

Personals

C. M. Weld, of New York, has returned from Cuba.

Frederic R. Weekes, of New York, has moved his office to 42 Broadway.

Dyke V. Keedy has arrived in New York from French Guiana where he spent several months.

Eugene H. Dawson, mining engineer, of New York, has removed from 71 Broadway to new offices at 42 Broadway.

H. A. Baker, chief chemist of the American Can Co., has gone to Washington to become a member of the committee on conservation of tinplate.

C. C. Hascall, formerly with the metallurgical department of the Westen-Mott Co., is now mining engineer for J. M. Longyear at Marquette, Michigan.

William W. Elmer, consulting mining engineer of Portland, Ore., has returned from Alaska where he has been for the past season.

Benjamin Vallat, major of the Michigan Battalion of Engineers, is making a recruiting trip through the copper and iron districts of Michigan.

H. L. Mead has returned to New York from Alaska, where he spent the past season in drilling gold placers in the northern part of the Seward Peninsula.

George H. Utter, mining engineer, formerly of Silver City, N. M., has changed his residence at Long Beach, Calif., from the Alamo Apartments to 329 Cedar Street.

B. M. Conklin, formerly at the Hill Annex mine at Calumet, Mich., has accepted the position of chief engineer of the Great Northern Iron Ore properties, with headquarters at Hibbing, Minnesota.

J. V. Richards has been commissioned a first lieutenant in the National Army. **Ernest Levy,** for many years manager of the Le Roi No. 2 mine at Rossland, B. C., will occupy Mr. Richards' offices and look after his clients' work in his absence.

F. W. Claflin, of the staff of Perin & Marshall, of New York, sailed for India from Vancouver on Nov. 22. He will erect at Sakchi the blast furnace recently dismantled at Battelle, Ala., which will be used by the Tata Iron and Steel Co. for the manufacture of ferromanganese.

R. H. Channing, president of Utah Consolidated Mining Co., and well known as a mining engineer, has returned to New York from a three months' training course at Fort Oglethorpe with a commission as captain in Field Artillery in the U. S. Army. It is said that Mr. Channing was No. 1 in a class of 4000. He is an old campaigner, having been one of the Rough Riders during the Spanish War.

Thomas F. Coyne was chosen to head the Mine Operators' Safety and Sanitation Association for southwest Missouri at a meeting held in Webb City on Nov. 30. He is a prominent operator of district and succeeds W. B. Shackelford. **C. T. Orr,** of Webb City, a member of the Government's zinc commission, was elected first vice-president, and **Howard I. Young,** district manager of mines for American Zinc, Lead and Smelting Co., second vice-president.

L. Douglas Anderson, superintendent of the Midvale, Utah, smeltery of the United States Smelting Co., has been appointed manager of smelteries for the company at Salt Lake City, Utah. The other members of this company's organization are as follows: George W. Heintz, general manager, Salt Lake City, Utah; C. E. Allen, manager of mines, Salt Lake City, Utah; A. R. Campbell, manager of smelteries, Kansas City, Mo.; D. D. Muir, Jr., manager of mines, Miami, Okla. One group is in charge of the Western business, while the other group is in charge of the zinc business. The company is a subsidiary of the United States Smelting, Refining and Mining Company.

Obituary

Henry E. Jacob, shipping agent at New York for the Calumet & Hecla Mining Co. since the company's organization in 1871, died at his home at 894 Park Place, Brooklyn, N. Y., on Dec. 8, in his 73rd year. He was born in Manchester, England, and came to New York 65 years ago. He was a member of the Union League Club of Brooklyn. He is survived by a widow, five sons and a daughter.

Arthur Lakes died at Nelson, B. C., on Nov. 21, aged 75 years. He was born in Cornwall, England. He came to this country as a young man, and eventually became associated with the Colorado School of Mines, being engaged there from its start until 1895 as professor of geology. He became well known throughout the West as a mining geologist. He was the author of the "Geology of Western Ore Deposits" and made numerous contributions to the descriptive geology of Colorado. His facility in pen-and-ink illustration added much to the attractiveness of his writings on these subjects.

Alfred Adair, chemist and metallurgist, of South Africa, died in September at the age of 63. He was born in Whitehaven, Cumberland, England, and educated at Owen's College, Manchester, and at the Royal School of Mines. He also studied at Heidelberg and Berlin under Bunsen and Hoffman. He was chemist at the Seaton-Carew Ironworks near Middlesborough, and was for a time at Nobel's Works in Scotland, and also at the Cyanide Manufacturing Works in Paris. For two years he was manager of the Great Britain Gold Mining Co. of the Witwatersrand. He was the originator of the Adair-Cruickshanks patent, taken out in 1899, in reference to fine grinding. The soundness of his views on this point was confirmed in later years by the general adoption of the tube mill. Later he came into prominence in connection with the Adair-Usher patent for dealing with slimes. He was a man of considerable scientific attainments and great originality of mind.

Societies

Mackay School of Mines, Reno, Nev., will repeat the "Prospectors Short Course" for the fourth time, beginning Monday, Jan. 7, 1918, and continuing four full weeks. This course is designed to aid prospectors and includes lectures on prospecting, assaying, mineralogy, geology, chemistry, hygiene, sanitation and mining law, together with laboratory work in assaying, mineralogy, power and first aid to the injured.

Montana Section of the American Institute of Mining Engineers held its semi-annual meeting at the Silver Bow Club in Butte, on Nov. 16. The technical session was preceded by an informal dinner. E. M. Norris presented a paper on the work done in fireproofing the Tramway shaft of the Anaconda company. C. L. Berrien and C. E. Nighman explained the process of hydraulic filling for extinguishing fires at the Anaconda company's Leonard and adjoining mines. Addresses were made by Benjamin B. Thayer, Spencer Miller and Robert Sticht.

Société de Chimie Industrielle has been formed in France with the object of creating a group open to all to aid the expansion of French chemical industry in all its branches; to call together all the industrial heads, professors, engineers, chemists, mechanical engineers, etc., who are interested in French chemical industry; to advance the industry both from an economic and a scientific standpoint. The means to accomplish these results are said to be the publication of a review; the organization of a congress, conferences, lectures, expositions, etc.; the establishment of an office for industrial chemistry and of a library, etc. The executive council is organized as follows: A. Haller and Henri Le Chatelier, honorary presidents; Paul Kestner, president; Felix Binder, M. Buchemin, M. Matignon and Edmont Staub, vice-presidents; Jean Gerard, general secretary; René Engel, secretary; M. de Germiny, treasurer; Paul Schoelihammer, librarian-historian.

Advisory Council for Scientific and Industrial Research in Canada has appointed subcommittees of scientists to assist its investigations. The sub-committee on mining and metallurgy consists of Dean Frank D. Adams, of McGill University, chairman; Prof. S. F. Kirkpatrick, Queen's University, vice-chairman; Major Charles L. Cantley, acting works manager, Nova Scotia Steel and Coal Co.; A. A. Cole, Cobalt, mining engineer for the Temiskaming & Northern Ontario Railway Commission; C. V. Corless, general manager Mond Nickel Co.; T. Denis, superintendent of mines, Province of Quebec; Charles Fergie, Montreal; A. R. Globe, assistant manager Hollinger Consolidated Gold Mines; Prof. George E. Guess, University of Toronto; Prof. J. C. G. Wilson, Queen's University; E. H. Hamilton, Trail, B. C.; Prof. H. E. T. Haultain, University of Toronto; Prof. A. Mailhiot, Ecole Polytechnique, Montreal; E. P. Mathewson, Toronto, general manager British-America Nickel Corporation; Lieut.-Col. D. H. McDougall, Sydney, N. S., general manager Dominion Steel Corporation; J. G. Morrow, Hamilton; Prof. J. Bonsall Porter, McGill University; F. D. Reid, Cobalt; W. Fleet Robertson, provincial mineralogist, British Columbia; F. H. Sexton, president Nova Scotia Technical College; Prof. A. Stansfield, McGill University; John T. Sterling, chief inspector of mines, Alberta; R. H. Stewart, Vancouver; J. B. Tyrrell, Toronto; O. E. S. Whiteside, Coleman, Alberta.

Industrial News

Marion Steamshovel Co. has sold the third 300-ton shovel in the Hibbing district, the first having been sold last spring to the Webb mine, the second to the Sellers mine and the last to the Winston Dear Stripping Co., for stripping the Scranton mine according to contract with Pickands Mather and Company.

C. D. Pruden Co., manufacturers of "Prudential" portable galvanized-steel buildings, Underwriter's hollow-metal windows and Kalamein doors and windows, with main office and factory at Baltimore, Md., will open a general sales office on Dec. 1, 1917, for their products in rooms 806-807 Wallace Bldg., 56-58 Pine St., New York. The office will be in charge of Leigh Pruden, vice-president of the company.

De la Vergne Machine Co., New York, announces the purchase of the company by William Cramp & Sons Ship and Engine Co., of Philadelphia. The new owners will continue both the oil-engine and ice-machine business. The De la Vergne shops will also assist in the production of marine steam engines and other work now being done by the Cramp company for the Government. No changes will be made in the organization with the exception of a new board of directors.

Trade Catalogs

Wire Rope and Cable. Walter A. Zelnicker Supply Co., 325 Locust St., St. Louis, Mo. Bulletin No. 225. Pp. 2; 3½ x 8½ inches.

Automatic Pumps and Receivers. Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin D-1301. Pp12; 6 x 9 in.; illustrated.

Du Pont Products. E. I. du Pont de Nemours & Co., Wilmington, Del. 5 x 8 in. Pp. 191. In addition to the various explosives made by the company, this book also describes Fabrikoid, a leather substitute, Pyralin, chemicals and paints made by its associated companies.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloy Containing Iron, Cobalt and Silicon. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., Niagara Falls, N. Y. (U. S. No. 1,247,206; Nov. 20, 1917.)

Aluminous Abrasive. Lewis E. Saunders and Ray Hill White, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 1,247,337; Nov. 20, 1917.)

Barium Hydrate, Process for Obtaining. Camille Deguide, Ixelles, Belgium, assignor of one-half to Désiré Barbais, Charleroi, Belgium. (U. S. No. 1,247,510; Nov. 20, 1917.)

Dump Car. William L. Burner, Columbus, Ohio, assignor to the Kilbourne & Jacobs Manufacturing Co., Columbus, Ohio. (U. S. No. 1,245,866; Nov. 6, 1917.)

Earth-Boring Machine. Albert Hunter, Spokane, Wash. (U. S. No. 1,245,348; Nov. 6, 1917.)

Excavator. Frank Hightower, Montrose, Colo. (U. S. No. 1,245,590; Nov. 6, 1917.)

Filtration—Method of Metallurgical Filtration. Percy A. Boeck, Los Angeles, Calif., assignor to Celite Products Co., Los Angeles, Calif. (U. S. No. 1,245,557; Nov. 6, 1917.)

Grinding Mill. James B. Shackey, San Francisco, Calif. (U. S. No. 1,245,625; Nov. 6, 1917.)

Ore Treatment, Process of and Apparatus for Pulverizing and Treating Ores, Clay and Other Mineral Substances. Alfred B. Willoughby, Philadelphia, Penn. (U. S. No. 1,246,514; Nov. 13, 1917.)

Phosphate Rock, Method of Treating. Herbert H. Meyers, Pittsburgh, Penn., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,246,636; Nov. 13, 1917.)

Editorial Correspondence

SAN FRANCISCO—Dec. 8

Comstock Ore sampling $88.89 a ton was extracted from No. 1 stope on the 2400-ft. level of the Union Consolidated recently according to reports from Virginia City, Nev. From No. 2 stope the ore sampled $49.12 a ton. A total of 181 tons was extracted from the two stopes. In addition to this 154 tons of ore was saved from the work done in repairs and timbering and placing of chutes in the three other stopes on the same level; this ore averaged $15.30 to $17.80. The Mexican mill treated a total of 376 tons of ore during the week ended Dec. 5, averaging $26.59 a ton. Repairs to the hoist and winze on the 2900-ft. level in the Mexican were in progress. Sierra Nevada is making progress in repairs and extending crosscuts and raises. Andes saved 81 cars of $10.30 ore. Ophir disclosed a vein on 2100-ft. level assaying $15.21 per ton for a distance of 30 feet.

Stock of No Par Value is provided for in a legislative act passed at the 1917 session of the legislature. The first California corporation to take advantage of this statutory enactment is the Buhles Process Co., represented by Judge Marcel E. Cerf. It is organized for the purpose of joining conflicting interests in patent applications now pending at Washington. The corporation has obtained authority from the corporation department of the state to issue its securities. The company is permitted to issue 1001 shares, 500 shares of which are issued to Julius A. Landsberger and 501 shares to William R. Pentz for total of $1001 cash. The law providing for this class of corporations was enacted at the suggestion of H. L. Carnahan, commissioner of corporations, who drafted the law following substantially the New York statute, so that California corporations may adopt this form of organization which is deemed advantageous in many cases.

Petroleum Engineers are in demand by the State Mining Bureau and a request has been made by State Mineralogist Hamilton and Oil and Gas Supervisor McLaughlin to the State Civil Service Commission that an examination be given applicants for such position with the petroleum department of the bureau. Carrying on the necessary and urgent work of the department has been greatly retarded by enlistment of engineers from the bureau into the Officers Reserve Corps, U. S. Army. The examination will be limited to persons having university training in geology and engineering. Prior experience in oil field work will be favorably considered at the time of examination, but is not essential, as the present engineering staff of the bureau has developed technical methods available to applicants having proper scientific education. The development of oil fields on scientific principles has been the basis of the building up of a department in the bureau that has demonstrated its need to the oil producers. Therefore the field for technically trained men will continue to widen.

BUTTE—Dec. 8

Anaconda's Taxes in Silver Bow County on the net proceeds of the mines and on all property amounted to $1,070,527 paid on Nov. 30. Another sum amounting to $101,339 was paid by the company into the city treasury as taxes on property and net proceeds from mines within the limits of Butte City, and the sum of $10,924 was paid to the Walkerville treasury for the same purpose, making a total of $1,182,790, which is more than half the taxes collectable by Silver Bow County for the present year. In other counties of the state the Anaconda company paid in taxes $485,763. The new corporation tax amounting to $428,376 was paid into the state treasury by the Anaconda company, last June, making the total sum of $2,097,000 for taxes paid by the company in Montana. Other mining companies of Butte paid taxes into the county treasury approximately as follows: W. A. Clark, $150,000; Butte & Superior Mining Co., $120,000; North Butte Mining Co., $56,000.

Tobacco Root Range in Madison County is the scene of much activity. Mining in this range of mountains, lying between Madison and Jefferson Rivers, has been stimulated during the year and promises to develop into considerable importance during the year to come. The Bielenberg & Higgins group of properties at the head of Bear Gulch is employing about 40 men and during the year was connected with a power line from the substation at Twin Bridges, permitting concentrator to be run by electric power. At the Lake Shore properties, located at the head of Wisconsin Creek, the mill is being remodeled and changed from steam to electric power. When completed about 40 men will be put to work at mine and mill. The Miller & Roach mill on the upper Wisconsin has been moved to the Little Goldie in Goodrich Gulch to treat the ore from this and the Eleanor claims which have been steady shippers for the last three years. At the Nick Traufler properties in Dry Georgia Gulch, which were recently sold to Washington men, a mill and other buildings are under construction and power line is being erected to connect the mines with the main line of Montana Power Co. Leasers and prospectors are active in almost every corner of the Tobacco Root Range and report having had good results in opening up new bodies of gold, silver, copper and zinc ores with prospects of developing them into producing mines.

Montana Silver Producers will join in protest against Government price-fixing and excess-profits tax. Senator Ravenel McBeth of Idaho spent Dec. 1 in Butte to urge upon Butte and other Montana silver-mining men the necessity of being present at a conference held in Salt Lake City, Utah, on Dec. 4, for the purpose of discussing the forthcoming Government price-fixing of silver and for drawing resolutions protesting against the new excess-profits tax provision of the income-tax law. The provision is considered to be not only not fair to all mine operators alike but to be so vague, ambiguous and contradictory as to be practically incapable of understanding and unworkable. While in Butte, Senator McBeth received a wire from Senator Borah of Idaho to the effect that the Secretary of the Treasury will hold the matter of price-fixing open until after the Salt Lake meeting. The arbitrary fixing of the price by the Government would render precarious many of the enterprises which have been recently undertaken in the expectation that the rise of the market price of silver corresponding to the natural demand for the metal would not be interfered with by artificial price-fixing, at least not without the consultation of the producers and without a careful investigation into the present cost of production. Butte being one of the largest silver producers in the country—Anaconda alone producing annually 13,000,000 oz.—is vitally interested in the subject of price-fixing and taxation and it is hoped here that the decisions of the Salt Lake conference will get an intelligent hearing from the Government officials before any serious harm is done. The muddle in which the coal situation of Montana and other states is now finding itself, shows what can happen when hasty action is taken in matters that are of vital concern to certain sections of the country and require for their intelligent administration the expert judgment of those who have made a life-long study of such matters and whose technical knowledge of local conditions entitles them to a hearing before they are arbitrarily interfered with in their legitimate activity.

SALT LAKE CITY—Dec. 8

Refund to Utah Copper Co. of $49,975 will be made on taxes paid in 1912 and 1913 to Salt Lake County, under protest. This amount is the difference between the amount paid by the company and the sum later fixed by the terms of judgments entered in the Federal courts.

Conference of Silver-Mine Operators was held in Salt Lake City on Dec. 4 and Dec. 5, having 75 representatives present from six Western states—Utah, Idaho, Washington, Montana, Colorado and Montana. The conference was the result of the efforts of the Utah chapter of the American Mining Congress and Idaho Mining Association. The meeting voted to form a permanent committee composed of two or more delegates from each Western state interested in the metal industry, to place the interests of metal producers before the proper authorities in Washington on Dec. 14. The delegates are to be appointed by the mining organizations of the states represented at the meeting. The Utah chapter of the American Mining Congress chose C. E. Allen, W. R. Wallace, and A. G. MacKenzie as representatives from this state. There were embodied in resolutions unanimously adopted a protest against Government price-fixing of silver other than for patriotic reasons and an appeal to Congress for correction of inequalities in the excess-profits tax law. A telegram to William G. McAdoo, Secretary of the Treasury, at the close of the conference, stating briefly the action taken by the meeting, informed him that the committee would be in Washington on Dec. 14, to discuss the matter fully. The highest degree of patriotism was given expression to in the resolutions of the conference, in that the metal industry of the West would accept without a murmur burdens, which literally meant confiscation, if such action should be necessary in bringing the war to a successful conclusion. The principle of an excess-profits tax was indorsed, but it was urged that the burden of taxation should be more equitably distributed. Some general exceptions were taken to the law in its present form, and these, as well as the appeal for relief, are given as follows:

"Whereas, this convention unanimously indorses the principle of an excess-profits tax and declares that the mining industry should bear its full proportion of such tax, a careful examination of the recently enacted war excess-profits tax law, however, reveals that its provisions will, in a very large number of cases, cause discrimination in favor of excessive capitalized companies as compared with those conservatively capitalized. Among the obvious defects disclosed by analysis, we point out the limitations imposed by sections 203 and 207, which are particularly objectionable, and which, when graphically illustrated, prove that inequality and injustice will result from the application of the law as enacted. Now, therefore, be it Resolved, That this convention respectfully appeals to the Congress to correct the manifest inequalities of the law as it now stands, and that copies of this resolution be sent to the President of the United States, the members of the cabinet, and Senators and Representatives in Congress." Before leaving the convention voted to take no action in regard to lead and zinc until such a time as the question of price-fixing in regard to these metals should be under consideration by the Government.

SPOKANE, WASH.—Dec 6

Coal Mines of Washington, in addition to extending their selling territory to points in the eastern part of the state which have been unable to secure their usual supply from states further east, are now furnishing points in Oregon and Idaho with an increasing amount of fuel. During the last week in November coal companies operating in Washington shipped 73 cars to Oregon, 10 to Idaho, four to California and one to British Columbia, with an average of 45 tons each, making an export total of about 3960 tons.

Treatment of Tailings is the purpose of the Spokane Metals Recovery Co., capitalized at $100,000 and recorded at Wallace, Idaho, with principal place of business at Mullan. The concern has a lease on a flat on Nine Mile, where 50,000 tons of tailings from the Rex mine have accumulated and has also arranged to secure tailings from the Interstate Callahan, Success and other mills. Samples of tailings show assays running over $6 per ton. The company expects to make a profit of $1.50 a ton on these tailings.

WALLACE, IDAHO—Dec. 8

Suit Against Hercules Mine Owners by Mrs. Mathilde Cardoner, who claims that she was induced to sell a one-sixteenth interest in the Hercules mine at a figure far below its actual value, was called in the U. S. district court at Cœur d'Alene on Dec. 6. The complaint was filed last March, the details of which were given in the "Journal," Mar. 31, 1917. The action is directed against all the owners of the Hercules, but specifically the defendants are Eugene R. Day and his sister, Eleanor Day Boyce, the purchasers of the

interest, and Harry R. Allen, who the plaintiff alleges induced her to sell through misrepresentations. In their answer to the complaint Eugene R. Day and Eleanor Day Boyce deny all allegations and assert that the price paid Mrs. Cardoner "largely exceeds a fair consideration for the property." The answers of Harry L. Day and Jerome J. Day disclaim connection with the deal, but state that they subsequently purchased one-fourth each of the Cardoner interest on the same valuation at which it had been purchased, which they regard as more than a fair consideration. In view of the valuation placed on the Cardoner interest in the answer filed by the Days, it is significant that within two months after the complaint was filed, a sworn statement showing that the net earnings of the company during the preceding calendar year amounted to $2,931,136, was filed with the county assessor by Eugene R. Day as manager of the Hercules.

TORONTO—Dec. 6

Victory Loan Subscriptions from the mining companies of northern Ontario were liberal. Among the largest subscriptions are the following: Mining Corporation of Canada, $500,000; Nipissing, $500,000; Hollinger Consolidated, $500,000; Kerr Lake, $250,000; Temiskaming, $200,000; McIntyre, $100,000; Dome, $50,000; Coniagas, $50,000, and McKinley-Darragh, $50,000.

Iron and Steel Production in Canada is rapidly increasing owing to the war demand. Returns received by the Mines Branch of the Canada Department of Mines covering the first nine months of 1917 show an output of 1,265,183 tons of steel ingots and direct-steel castings, as against 911,054 tons during the corresponding period of 1916, making an average monthly production of 140,572 tons, as against an average monthly production of 106,268 tons throughout 1916. A significant feature is the great increase in the output of steel in electric furnaces included in the above figures, 30,960 tons having been produced during the first mine months of 1917, as against a total of 19.639 tons for the entire year 1916. The production of pig iron was 895,307 tons as compared with 844,717 tons for the first nine months of last year.

THEDFORD MINES, QUEBEC—Dec. 10

Asbestos Mining is active in the Thedford district as shown by the organization of new companies, installation of new machinery and the amount of construction work completed recently. The Bennett-Martin Chrome and Asbestos Co. has recently been organized with a capital of $1,500,000, for the mining and exploitation of chrome and asbestos on the estate of the King Bros, Ltd., in the Black Lake-Coleraine district. The financial interests are largely the same as those in the Martin-Bennett Asbestos Co., Thedford Mines. Lot 26, Range 3, of this property was worked for crude ore last season and the results obtained were highly satisfactory. The company has commenced the erection of an asbestos mill which will be installed during the winter. The Windsor Asbestos Co., at Coleraine, has completed its asbestos mill, and will commence operation as soon as electric motors arrive. The Jacob's Asbestos Co. at Thedford Mines has its new shaft down 400 ft., and the steel headframe for same is now in place. This departure in asbestos mining will be tried out by the Jacob's company, and will demonstrate whether quarry or pit mining is most suitable to asbestos. The milling system will be employed, and it is held that many of the objections experienced in the quarrying method will disappear. In contrast to this the quarrying men are speeding up production by the introduction of steam shovels of various types. The Jacob's interests have acquired control of the Federal Asbestos Co., at Robertson, and J. M. Forbes, formerly of the Black Lake Consolidated Asbestos Co., has replaced A. E. Audette as superintendent. Wages have been rapidly advancing during last year, and now stand at 30c. an hour for the quarry labor. One company has broken away from the established custom by paying the surface men the same as the quarry men, though it is generally held to be good practice to pay the higher wage to the miner, as there is always the greatest shortage in this class of labor. Probably, in this respect the asbestos industry is unique among mining camps of the world as the one where there is perfect discord among the operators. Feeble attempts have been made in the past to have current practices standardized but with little success. The popular practice of the incoming superintendent is to condemn and discard the principle and system worked out by his predecessor. Owners and operators insist on divergent policies even though it destroys the united front which might be employed to put the industry on a sound and permanent paying basis. The present period of prosperity might well be employed to establish the unity characteristic of successful mining camps.

The Mining News

ALABAMA

Jefferson County

REPUBLIC IRON AND STEEL CO. (Birmingham)—Two of the three Thomas furnaces blown out because of coke shortage, fire having destroyed tipple and coal washer at Sayreton mines. Will reduce iron production of district, 500 to 600 tons per day.

UNITED STATES STEEL CORPORATION will have ships built at Mobile by the Chickasaw Shipbuilding Co., which has been recently organized as a subsidiary company. Officers: Geo. G. Crawford, president; H. C. Ryding, vice president; J. F. Coleman, general superintendent; L. T. Beecher, secretary-treasurer. Will begin work at once; 10 shipways will be laid down; large power plant, shops and office to be erected. Two large villages laid out, one for white and one for colored employees. About 1600 houses will be completed during coming year.

ALASKA

JUALIN ALASKA MINES CO. (Jualin)—Work suspended pending readjustments and preparations for resumption on much larger scale before spring. Will increase present 10-stamp mill, by addition of pebble mill, to capacity of 150 tons per day. Work on 7800-ft. tunnel crosscutting property and draining mine will be resumed; tunnel now advanced 2000 ft. Recovery of gold during last 12 months amounted to $197,296. Controlled by Belgian and French capital; main office in Paris, France. Charles G. Titus, of Jualin, Alaska, manager.

ARIZONA

Gila County

INSPIRATION (Miami)—November production of copper amounted to 2,500,000 lb., compared with 2,400,000 lb. in October.

OLD DOMINION (Globe) — Production for November was 2,844,000 lb. copper, comparing with 2,623,000 lb. in October.

Mohave County

TWINS (Kingman)—Purchased by Daisell Mining and Milling Co., of New York. The old shaft over 300 ft. deep will be unwatered, retimbered, and sinking will be resumed.

Pima County

MORGAN (Tucson) — Recent developments on first and second levels under direction of new management opened considerable tonnage. Has been opened to depth of 900 feet.

Pinal County

PINAL CONSOLIDATED (Price)—Repairs on wagon road completed and ore hauling begun. Development satisfactory and large output expected soon.

BROKEN HILLS (Ray)—Wagon road nearly completed. Hoist will be installed when it can be put on ground; working force to be doubled.

MAGMA CHIEF (Superior)—Diamond-drill exploration begun from 900-ft. point in Watson tunnel. At present making 15 ft. per day. First hole will be about 600 ft. deep.

RAY LEAD (Ray) — Purchased large number of pack animals and will increase shipments to 1000 tons a month. Surveys being made to determine advisability of connecting with Broken Hills road.

ARKANSAS

Boone County

ZINC CAMP OPERATIONS hampered by car shortage on White River division. From 20 to 25 carloads hand-cobbed silicate of zinc and concentrates in various mine bins awaiting shipment. McCurry Mining and Milling Co. has repaired custom mill; machinery purchased by the same company for 100-ton mill on Rhodes-Manchester mine. L. L. Brown mill, shut down for repairs for several weeks, is again running.

CANTRELL (Lead Hill)—Coy Cantrell started deep drilling operations on ground three miles north of here. Expects to go to depth of 500 ft. for lead or zinc; is down now 50 ft.

Newton County

CONFEDERATE (Cave Creek)—Mill of 300 tons capacity at Confederate mine put in operation. Property was opened by Confederates during Civil War and furnished lead for munitions. Operated by three shafts and opencut; producing lead and zinc ore. James P. Aylward, president; Harry Sandler, secretary-treasurer.

CALIFORNIA

Amador County

PINE GROVE MINING CO. (Pine Grove)—Permit for issue and sale of stock revoked by commissioner of corporations.

PLYMOUTH CONSOLIDATED (Plymouth)—In October treated 10,800 tons ore, with estimated yield of $56,215; working expenses, $34,010; development, $4743. Surplus over working and development, $17,461; capital expenditure, $1161.

OLD EUREKA (Sutter Creek)—Bottom of shaft reached at depth of 2065 ft. From 1600-ft. level down, former owners prospected and mined by single-compartment shaft. Has been enlarged as work proceeded to a three-compartment shaft. Work has been difficult on account of cleaning out old debris and removing caved ground. Now repairing and enlarging 2000-ft. station. Pay ore in sight at this level and expected development at this point will proceed and at upper levels before deepening shaft.

Butte County

OROVILLE DREDGING (Oroville) — Boston No. 4 dredge will start redredging old ground worked several years ago by Risdon boats. Early day dredging did not recover all gold and believed that sufficient amount remains to warrant redredging. Gross returns for week ended Oct. 11 for two dredges was $4409; for week ended Oct. 18, $4042.

Calaveras County

TANNER (San Andreas)—Explosion in tunnel caused injury to two men who were able to escape before second explosion followed. Supposed to have been result of missed holes.

Eldorado County

LIVINGSTON (Fairplay)—Reported that Frank Dittmar and W. Pittenger of Dillon, Mont., are examining property with view to reopening it.

MISSION FLAT (Placerville)—Unwatering old 65-ft. shaft of this copper mine completed. Reported vein 18 in. wide disclosed carrying chalcopyrite and bornite with good copper contents. If development warrants, a concentratng plant may be constructed.

Inyo County

ZINC OREBODY reported disclosed nine miles from Darwin. Ore is said to be near surface and vein has width of 500 ft. Being developed by Utah men.

FRIDAY (Bishop)—Reported sold to M. Yalovica and associates of Goldfield for $40,000. Ore assaying high in silver and carrying some lead and gold said to have been disclosed by short tunnel opening a 30-in. vein.

Kern County

CALIFORNIA KALI CO. (Los Angeles)—Permitted to sell 5000 shares capital stock at $1; proceeds for prospecting and developing placer claims for potash deposit in southeastern part of county.

BUTTE (Randsburg) — Test run on waste dumps in new 10-stamp mill reported profitable. Dumps above mill are broken down into chute carrying material to cars on track below, and then trammed to mill bins. Gross returns said to average about $6 per ton.

Los Angeles County

WALNUT CREEK MINING AND MILLING CO. (Los Angeles)—Supplementary permit to sell 20,000 shares capital stock at 50c., to present stockholders.

Nevada County

YOU BET (Dutch Flat)—Reported completion of débris restraining dam in Missouri Canyon and construction of long flume; hydraulic mining will be resumed within short time. Resumed mining at You Bet by San Francisco men with Mr. Gerdetz, superintendent. Old You Bet mines were former gold producers but anti-débris law prohibiting running of tailings into navigable streams or tributaries caused shutdown.

Placer County

SAN FRANCISCO (Forest Hill) — San Francisco men prospecting this property, situated below Dardanelles mine and about 2½ miles southwest of Forest Hill. Opened in early days by tunnel.

Sacramento County

NATOMA NO. 10 (Natoma)—Was first steel-hull dredge built in California; undergoing repairs to be completed in December. No. 10 was experiment in steel-hull construction and at time of installation was disappointing because of inadequate flotation. This fault was corrected before digging began; afterward handled the heaviest kind of gravel and proved dredge to be substantially constructed. It has been operating five years and with necessary repairs is good for another five years' work.

San Mateo County

LIBERTY OIL REFINING CO. (Oakland)—Authorized to issue 110,000 shares at $1, in exchange for leases in Purisima Creek district, containing 900 acres. Company required to reassign 10,000 shares to the corporation to be disposed of as treasury shares at 50c. per share; proceeds to be utilized in repairing and improving equipment. Further permit to sell 15,000 shares, proceeds to be used in development. There are four cased wells, two of them producing about 2 bbl. of oil each per day and 3000 cu.ft. of gas per hour. Other wells and oil producing equipment are included.

Shasta County

GREENHORN (French Gulch) — Shipment of 800 tons of copper ore being hauled by motor trucks to Redding for transportation by rail to Mammoth smeltery at Kennett. Situated near Tower House; motor road distance about 22 miles; trucks carry about five tons.

Yuba County

YUBA CONSOLIDATED GOLD FIELDS (Hammonton)—Reported to contemplate construction of another new dredge to be known as No. 18. Will probably be constructed by Yuba Manufacturing Co.

COLORADO

Boulder County

MELVINA (Salina)—Three shifts engaged in unwatering property; 700-ft. shaft unwatered to 640-ft. depth. When completed active development will be started. Surface plant overhauled and placed in working order. A. Murphy, manager.

VICTORIA (Summerville)—Employing 10 men on development. Property opened to 470-ft. depth. Two triplex plunger pumps will keep mine unwatered; one on 270-ft. level driven by 15-hp. motor, and other on 470-ft. level driven by 25-hp. motor. Will work one Dreadnaught drifter and two stoper drills recently added to equipment. Carload of 53-oz. silver ore recently shipped from development. Frank M. Pickard, superintendent.

YELLOW PINE (Boulder) — Several leases in successful operation. Cochran Bros. developing Michener vein on sixth level, 900 ft. from beginning of tunnel; ore opened shows good silver, copper and lead contents. Pocket of high-grade assayed $1200 a ton; 12-ton shipment of 200-oz. silver ore made recently. Ore opened in block being operated by Al. Steelsmith assays from 170 to 780 oz. silver per ton. Another block on same vein, operated by Wallace & McHarg produced 12 tons high-grade shipping ore. Peter Burges, employing 10 men on Mudd vein, shipping two cars per month; last shipment of 14 tons assayed 180 oz. silver per ton. Drift advanced 100 ft. on Mudd vein by Ernest Meyring and Arthur Meyers under contract. On Yellow Pine vein, Adams & Stromberg working 1000 ft. from tunnel portal and 700 ft. below level. Old stope yielded several carloads of 50-oz. silver ore. Development being done on Gray Copper vein by Pearl Horton. Payable ore opened on Duroc and Vancluse veins. Most of ore shipped is purchased by W. J. Chamberlain Ore Company.

Clear Creek County

ORE SHIPMENTS FROM IDAHO SPRINGS during October were heavier than in any previous month during 1917; 61 cars of 20 tons each shipped having value above $25 per ton. Total output from Clear Creek County during month was about $100,000.

Gilpin County

GILPIN-EUREKA (Central City)—Mill operating two shifts to treat increased production. Good-grade ore opened on 700-ft. level. Smelting-grade ore also mined. Shaft sinking will be resumed soon.

Saguache County

KAPI (Bonanza)—Continues development in May Bell tunnel being driven to cut Shawmut vein. New compressor plant installed. Curtis compressor and Wagner motor supplied by Mine and Smelter Supply Co., of Denver. Drilling equipment purchased from Denver Rock Drill Manufacturing Co. W. H. Wright, of the Malm-Wolf Co., consulting engineer.

San Juan County

WAR EAGLE (Silverton)—Development discontinued for winter; will be resumed early next spring under management of P. J. Holngrain.

CRATER GOLD (Durango)—New lower tunnel advanced 200 ft., opened vein of low-grade milling ore. Shipping ore produced from development in upper tunnel. Emma N. tunnel advanced 50 ft., and a shoot of good-grade ore opened. Ore bins built at mine, but owing to shortage of labor new bunkhouse not completed in time for winter use, and operations discontinued until early spring. M. H. Kingsley, manager. Mine near Animas Forks.

San Miguel County

SHIPMENTS FROM TELLURIDE during October were as follows: Tomboy, 50 cars of concentrates; Smuggler-Union, 40 cars; Black Bear, 28 cars; Liberty Bell, 8 cars; lessees, 2 cars; total, 128 cars.

NEW DOMINION (Ophir) — Shipped payable crude ore from development; small concentrating mill under consideration.

LEWIS (Telluride)—Main shaft unwatered to first level. Development and mining will be resumed when property is completely unwatered.

GERTRUDE (Telluride)—Mine situated in Bear Creek; developed during last season by Farrell & King. Silver and copper ore opened; a lower crosscut tunnel under consideration.

LEWIS (Telluride)—Winter supplies being laid in: elevation is 12,000 ft. and inaccessible during winter. Work will continue all winter; mine to be reopened, mill remodeled and flotation installed; carload of machinery received.

Summit County

ROYAL TIGER (Breckenridge)—Reopening old I. X. L. mine; machine drills will be installed soon. Boarding and bunk house and saw mill built recently.

Teller County

BACKOFF LEASING CO. (Cripple Creek)—Operating Midget mine, of Midget-Bonanza Gold Mining Co., discovered rich ore.

ELKTON (Elkton) — Lessee Barnard shipping high-grade ore from block between 3rd and 4th levels of Elkton shaft, on Henley vein.

ISABELLA (Cripple Creek)—Lateral development on 1500-ft. level of winze from 1250-ft. level of Lee shaft. Drifting on East Vindicator vein, and crosscutting 220 ft. to Buena Vista vein.

IDAHO

Bonner County

ARMSTEAD MINES (Talache)—During November reported main tunnel known as No. 3 advanced 489 ft. in 28 days, comparing with 488 ft. in 29 days in October. Both figures are records for tunnel driving in Northwest. Cost is estimated at $15.21 per foot. Tunnel being driven to cut vein on lowest level.

Shoshone County

CALEDONIA (Wardner)—Earnings for October were $90,000, a decrease of about $20,000 from the 1917 monthly average. Efforts to find oreshoot on Keating level failed; upper workings nearing exhaustion. Has $800,000 surplus, which will be disbursed eventually.

CARBONATE HILL GIANT (Mullan)—Following acquisition of control of Carbonate Hill and Idaho Giant a few months ago, W. D. Greenough organized Carbonate Hill Giant Mines Co. and has had engineers formulating extensive plan of development to begin about Jan. 1.

SHERMAN (Burke) — Shipping ore struck in raise from main tunnel, starting on 2-in. stringer of galena, which widened to 14 ft. after raising 35 ft. About 500 ft. below upper tunnel and about 700 ft. from surface much ore is exposed. About 500 ft. more depth can be obtained by lower tunnel, which is contemplated.

DOUGLAS (Beeler) — Shipments almost suspended on account of bad condition of road. Ore developed in tunnels Nos. 2 and 3 and in drift from shaft 100 ft. below No. 3. Vein recently discovered on opposite side of canyon, showing 14 in. of oxidized zinc-lead ore with a little sulphide. Under lease to Anaconda company; 70 men employed.

REX CONSOLIDATED (Wallace) — Bond held by this company on property of the old Rex Mining Co. taken up by acceptance of old company of 1,000,000 shares in the consolidated company. Bond was for $200,000 and expires in July, 1920. This action was taken by the stockholders of Rex Mining Co. at meeting held in Augusta, Maine, on Nov. 19. Rex Consolidated Co. has capital stock of 5,000,000 shares, 2,000,000 of which will be sold for development purposes. No less than $75,000 is to be spent on Rex property, the work to include extending shaft 300 ft. from 700-ft. level. Company also owns tract of lead-zinc land in the Miami district, Oklahoma, which will also be developed.

MICHIGAN

Copper

SOUTH LAKE (Houghton)—Produced 2345 tons of rock in November.

FRANKLIN (Demmon)—Output was 27,720 tons for November.

ADVENTURE (Greenland) — Following suspension of work, mine shipped 35 tons to mill.

MASS (Mass)—At present producing 1000 tons of rock daily; gradually increasing output. November production was 19,000 tons.

ALLOUEZ (Allouez)—New boilers installed throughout and entire surface plant being improved. Production maintained at 1800 tons daily.

CHEROKEE (Houghton)—Exploration work continues to show small mass and shot copper east of 420-ft. level; west drifts advanced 70 ft.

SENECA (Mohawk)—One boiler now working; one stack erected and another ready for erection. All machinery installed. Will start mining on Jan. 1.

AHMEEK (Ahmeek)—Output continues to break all previous records, being close to combined output of three Copper Range mines. Shipped 104,000 tons in November.

CENTENNIAL (Calumet) — Yield for present year will be close to 2,250,000 lb. an increase of three quarters of a million pounds over 1916, owing to richer quality of ore and slight increase in tonnage.

CALUMET & HECLA (Calumet)—Production for November from C. & A. mines was 245,000 tons; Isle Royale, 13,000 tons to Point Mills plant and 54,000 tons to own mill at Pilgrim; Osceola, 97,500 tons.

LA SALLE (Calumet)—Stoping only in No. 1 shaft, down to 15th level inclusive. Rock shipments amount to 50 tons daily, half from this shaft and half from No. 2. At latter, now drifting on bottom, the 21st level; grade of rock is so low that it just permits working.

COPPER RANGE (Painesdale)—Three mines maintaining production; a slight falling off may occur in November output but total rock tonnage was same as for October; both months under average for 1916. Champion is producing over 60,000 tons per month; Baltic, 30,000 tons; Trimountain, 20,000. Trimountain showed a slight increase in tonnage last month and falling off occurred in Baltic's tonnage.

MINNESOTA

Mesabi Range

ALPENA (Virginia)—Oliver Iron Mining Co. testing two types of underground loading machines developed on Mesabi, the Middlemiss and the Hoar. Middlemiss machine developed by Bruce Middlemiss, superintendent for Todd-Stambaugh interests; other machine is invention of Captain Hoar of M. A. Hanna interests.

MONTANA

Deerlodge County

NATIONAL TUNGSTEN CO. (Anaconda)—First shipment of 2800 lb. of concentrates to eastern refineries made from Windy Gap mines, said to be worth $1 a lb. At Hidden Lake, construction of mill and cyanide plant to be completed shortly.

Madison County

IN SHERIDAN DISTRICT, reported that Bedford mine and mill will resume. Mill and electric power line completed some years ago and property is ready for exploitation and treatment of ore.

IN TWIN BRIDGES DISTRICT, Michael Miller is making small shipment of silver ore from mine above Governor Pollinger Springs, between Bear and Dry Gulches. George Bonantz has well-developed property near old Tidal Wave between Dry Georgia and Goodrich Gulches; shipping ore during the summer.

Silver Bow County

ANACONDA (Butte)—November production was over 21,666,000 lb. of copper and about 4,000,000 lb. of zinc. Prior to last summer's labor disturbances, monthly output averaged 28,000,000 lb. of copper, including North Butte production, making present Anaconda production nearly 90% of normal with prospects of reaching normal before end of year.

NEVADA

Elko County

HOLDEN MINING AND MILLING (Tuscarora)—Will introduce a new system of milling as flow sheet includes electrocyaniding, introduced by Prof. E. R. Holden, of Los Angeles, formerly of the Colorado School of Mines. J. D. Hubbard, superintendent.

Lander County

GOLD TOP MINING (Battle Mountain)—Installed 35-ton ball mill and started operating. Six claims with 585 ft. of tunnel; crosscutting and connecting shaft completed. Ore taken out through tunnel. Situated in Copper Basin district, about seven miles from Galena.

Nye County

TONOPAH ORE PRODUCTION for week ended Dec. 1 amounted to 10,061 tons valued at $176,067, comparing with 10,093 tons, the previous week. Producers were: Tonopah Belmont, 2565 tons; Tonopah Mining, 2800; Tonopah Extension, 2380; Jim Butler, 500; West End, 1128; MacNamara, 470; Montana, 116; North Star, 56; and miscellaneous, 46 tons.

White Pine County

MINERVA SCHEELITE MINE, situated 20 miles south of Osceola, in Snake Range, recently sold to a Mr. Werner, of Los Angeles, a $5000 cash payment being made. Two-ton mill on property, but unknown if property will be worked.

NEW MEXICO

Grant County

BONNEY (Lordsburg)—Water on 400-ft. level under control. Lawrence Mining Co. operating property; will work ore lenses encountered in development.

85 MINING CO. (Lordsburg) — Constructing 400-ton mill. Allis-Chalmers ball mill just received. Plant to be operating by March. Preparing for installation of fourth Deisel-engine unit, making four Lyons-Atlas 500-hp. engines in use.

SOUTH CHINO COPPER CO. (Lordsburg)—Will be name of new company, formerly known as Atwood Consolidated Mining Co., operating Atwood and Southern groups. Financed in Boston; payments completed on property until January, 1917.

Lincoln County

VERA CRUZ (Carrizozo)—Mill equipment and electrical machinery for mine shipped for working property on large scale.

OREGON

ANDERSON'S (Kerby) — This placer mine on Illinois River, six miles from here, installing Joshua Hendy elevator purchased from Logan placer mine. George Anderson, owner.

BIGELOW & BOUR (Kerby)—Hydraulic equipment installed at this chrome mine on Illinois River, six miles from here. Soil surrounding the chrome to be piped away. William Bigelow and David Bour, of Kerby, owners and managers.

KERBY QUEEN (Waldo) — Reopening this chrome mine, five miles northeast of Waldo. Developed by 900-ft. adit on lower level and 300-ft. adit on upper. Considerable tonnage of 4% copper ore on dumps; ore averaging $6 gold per ton being shipped.

UTAH

Juab County

TINTIC SHIPMENTS for November, covering five weeks, amounted to 893 cars as compared with 634 in September and 929 in August, also of five shipping weeks. Tonnage estimated at 44,000 tons valued at about $1,000,000. Shipments for two leanest weeks were 129 and 127 cars respectively and last two weeks of month, with improved transportation, over 200 cars each. Heaviest shipper was Dragon Consolidated with 172 cars largely of fluxing ore. Iron Blossom was next with 107 cars and Chief shipped 104 cars. Shipments for week ended Nov. 30 were 183 cars.

TINTIC DRAIN TUNNEL (Eureka)—Stock to be listed on Salt Lake Exchange; capitalization, 3,000,000 shares, par value, 5c., with 1,500,000 shares remaining in treasury; also $26,788 in cash. Owns 24 patented claims, 315 unpatented claims, and 600 acres of land at mouth of tunnel to be driven for development, drainage and irrigation. Ground already opened by shafts, tunnels and winzes shows some ore. Utah Power and Light Co. working on power line extension; expected to have power for drills available in December. Boarding-house, bunkhouse, blacksmith shop completed and equipment for beginning work installed. Jesse Knight, of Provo, president.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Connections made with Michigan-Utah tram line allows easier shipment from lower workings.

SOUTH HECLA (Alta)—Dwyer tunnel level continues production, new find about 5000 ft. east of older workings said to show indications of orebody.

COLUMBUS-REXALL (Alta)—November shipments amounted to 600 tons. Unfavorable hauling conditions prevent larger shipments.

CARDIFF (Salt Lake)—Bad roads between mine and bins at south fork of Big Cottonwood restricting shipments to this point. So far shipments to smelters from accumulation here, awaiting better market for lead ores, have not been started.

Summit County

PARK CITY SHIPMENTS during November were 13,142 tons of ore and concentrates, according to preliminary figures, this being the heaviest month of the year thus far. Ontario Silver shipped 3990 tons, being the largest output for the year. Judge Mining and Smelting shipped 3409 tons, being its heaviest month also; the electrolytic zinc plant is adding considerably to output. Silver King Coalition and Silver King Consolidated follow with 3270 and 1025 tons respectively. The Daly West shipped 800 tons. Twelve properties shipped.

Tooele County

DUGWAY COPPER (Salt Lake)—Copper reported found on recently acquired claim and work, suspended for some months, resumed. Owns six patented claims and two unpatented claims. Shipping point for camp is Faust Station, 55 miles by wagon-road.

Utah County

SERVICE POWER LINE is being planned by the Earl Eagle, Bellerophon, and Globe Mining companies in American Fork Canyon to furnish power for their properties.

EARL EAGLE (American Fork)—Tunnel in about 1300 ft. Winter supplies in.

BOG MINING (American Fork)—Tunnel being driven for contact, about 400 ft. below old tunnel workings, which have been discontinued.

WASHINGTON

NORTHWEST MAGNESITE CO. (Chewelah)—Producing average of 180 tons calcined magnesite daily. Third metal kiln put in operation and six-mile tramway almost completed. Large calcining plant nearly completed. Cost of plant and tramway, about $250,000.

VALLEY MAGNESITE CO. (Chewelah)—Shipped 20 carloads of 40 tons each calcined material, averaging $32.50 per ton. Operating and haulage cost, $10 per ton; expect reduction to $6 per ton when railroad is built to property. Eight more kilns to be built, making total of 11 and providing capacity of 150 tons daily of calcined material.

CANADA

Manitoba

ELIZABETH GROUP (Herb Lake)—Mines Exploration Syndicate (Makeever Bros., 170 Broadway, New York) has secured controlling interest, which was held by Pas Consolidated Mining Co., of Winnipeg. Mines Exploration Syndicate agrees to spend $250,000 in development during next two years.

Ontario

WHELPDALE (South Porcupine)—Installing small plant.

GIFFORD (Cobalt)—Vein, 10-in. wide, showing native silver cut on 350-ft. level.

BURNSIDE (Kirkland Lake)—Acquired by Alladin Mining Co. The same interests control Chambers Ferland in Cobalt.

PORT ARTHUR COPPER (Mine Centre)—Mining plant, including air compressors, installed, and two working shafts being sunk.

TECK HUGHES (Kirkland Lake)—Will increase capital from $2,000,000 to $2,500,000; new stock to provide for mill extensions and additional development.

HOLLINGER CONSOLIDATED (Timmins)—Reported recent developments on the Millerton give width of orebody opened on 400-ft. level as 70 feet.

LA ROSE (Cobalt)—Received authority to cut capital of La Rose Mines, Ltd., the Ontario company, from 6,000,000 shares of $1 par to 1,500,000 shares of $1 par. Will be transferred share for share with La Rose Consolidated, the American company, which has 1,500,000 shares of $5 par. American company will be liquidated.

KIRKLAND LAKE (Kirkland Lake)—Purchased by Beaver Consolidated, with exception of small amount of outstanding stock. Total purchase price was approximately $300,000 in four instalments. For each payment a corresponding block of stock was delivered. Owing to heavy expenditures of Beaver development and installation of 150-ton mill, about one-half of stock covered by last instalment of $75,000 was not taken over.

Yukon

CANADIAN KLONDYKE (Dawson)—On application of Granville Mining Co. Judge MacAulay appointed Harold G. Blankman, deputy clerk of the Yukon Court, as temporary receiver for Canadian Klondyke Power Co. and Canadian Klondyke Mining Co. on ground of failure to issue bonds for loan of $1,350,000, or to pay interest thereon. Applicants explained that it was not their intention to shut down operations but to secure an adjustment and arrange for payment of all obligations.

MEXICO

EMBARGO ON GOLD AND SILVER ORES will be raised by the Mexican government as the result of an agreement made with the United States. The agreement entails upon the United States the obligation to return the entire gold content of the ore and 25% of the silver extracted from the ore.

CHILE

CHILE EXPLORATION (Chuquicamata)—Production in November was 8,872,000 lb. copper, comparing with 9,050,000 lb. in October. Operations are limited by supply of fuel oil.

PERU

CERRO DE PASCO (La Fundicion)—Production for November, according to cable dispatch, was 6,440,000 lb. blister copper, comparing with 7,325,032 lb. in October.

AUSTRALIA

MOUNT LYELL MINING AND RAILWAY (Mount Lyell, Tasmania)—Cable advices from Melbourne report ore treated during year ended Sept. 30 was: Mount Lyell, 152,668 tons; North Mount Lyell, 82,878 tons; Concentrates, 4049. Ore extraction suspended three weeks in May, owing to strike. Produced 5832 tons blister copper containing 5766 tons copper; 295,126 oz. silver; 7455 oz. gold. Cost of producing blister copper was $6.45 "per ton of ore including concentration." Owing to diminished output, it was only possible to run two furnaces during the year. Smelting was entirely suspended for 19 days and one furnace only was running for 16 days on account of strike. Ore reserves based on last estimate were: Mount Lyell, including South Mount Lyell, 2,013,439 tons; North Mount Lyell, 997,904 tons. Flotation plant treated Comstock and low-grade North Mount Lyell ores totaling 14,129 tons assaying 2.91% copper, and yielding 3902 tons of concentrates assaying 9.31% copper.

INDIA

GOLD PRODUCTION of Kolar Field in Mysore during October was 43,041 oz. fine, being 166 oz. less than in September, and 2020 oz. less than in October, 1916. The decrease was chiefly in the Balaghat and the Champion Reef. For the 10 months ended Oct. 31, the production was 452,554 oz. in 1916, and 432,584 oz.—or $8,941,511 in value—in 1917; a decrease of 19,970 oz. this year.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
6	4.7515	85⅜	42¼	10	4.7515	85⅜	42⅞
7	4.7515	85⅜	43	11	4.7515	85⅜	42⅛
8	4.7515	85⅜	43	12	4.7515	85⅜	42⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
6	*23½	†88	6½ @6¾	6.25 @6.35	7.50 @7.60
7	*23½	†88	6.25 @6.40	6.25 @6.35	7.50 @7.55
8	*23½	†88	6½ @6¾	6.25 @6.35	7.50 @7.55
10	*23½	†88	6½ @6¾	6.25 @6.30	7.45 @7.55
11	*23½	†88	6½ @6¾	6.25 @6.30	7¼ @7½
12	*23½	†88	6½ @6¾	6.25 @6.30	7¼ @7½

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Dec.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
6	110	110	125	292	290	30½	54
7	110	110	125	293¼	291¼	30½	54
8	...	...	...	...	...	...	...
10	110	110	125	296	293½	30½	54
11	110	110	125	298½	295½	30½	54
12	110	110	125	302	296½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.212120 5c.

Metal Markets

NEW YORK—Dec. 12

All of the metal markets this week were characterized by great dullness. However, there were features of interest.

Copper—The matter that was most talked about this week is the forthcoming conference between the copper producers and the War Industries Board to be held in Washington on Dec. 14, at which is to be discussed the matter of price to prevail subsequent to January, 1918, when the present agreement will expire. It is hoped that an announcement will follow soon after the meeting on Dec. 14.

In the meantime, some of the smaller producers have made bitter representations to the Copper Producers' Committee that they cannot supply copper at 23½c. without losing money. It is well known also that producers in South America, whose output is imported into this country, are suffering very keenly from present conditions, the matter of exchange rates adding to the difficulties in their case, and some of them have actually suspended operations with the result of diminishing the supply of American refiners from that quarter.

Another feature of interest this week were sales of copper at 23½c., cash, New York, to domestic consumers for delivery subsequent to January, some contracts having been entered into for delivery as far ahead as June. Several producers booked business of this kind, the volume of which attained proportions considerably larger than in previous weeks. The consumers who entered into these contracts were covering orders that they had already received. The bulk of this business was negotiated at the specific price, without any guarantee against decline.

From Washington we hear that officials interested in copper are much gratified at the gradual increase of production at Anaconda, which now is running at about 90% of capacity. Information reaching Washington is that the December production in Arizona will be greater than was anticipated. Fuel and transportation conditions, as they affect the copper industry, have disturbed officials somewhat; but, through influences they were able to bring to bear, these hindering factors in no case have become serious.

Under the system adopted for less than car load lots, the trade has been provided with small lots in proportion to its requirements and the urgent demand in that quarter seems to have been taken care of fairly well.

Copper Sheets were cut on Dec. 7 to 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26@27c., f.o.b. mill, carload lots.

Tin—Such business as was done was of surreptitious character and in very small lots. We continue to quote the market at 88c., but that is purely nominal and not representative of actual business.

Beginning with Dec. 10 the American Iron and Steel Institute took charge of the distribution of tin supplies, under sanction of the U. S. Government. Hereafter the British consular officers will release tin only to it.

Lead—This market was dull and rather spotted in character. Some producers booked a fair amount of business, while others got none at all. In certain cases, producers took no business for the reason that they are sold out for a considerable time ahead. Other producers who had supplies at their work were in some cases unable to accept business owing to impossibility of making the delivery wanted, because of the freight congestion. In some quarters the lead market was thought to exhibit a slightly firmer tone, while in other quarters the opposite opinion was expressed.

The lead producers will meet the War Industries Board in Washington on Dec. 17, at which meeting will be discussed the fixing of a maximum price for lead. The lead required by the Government is being provided at present on the basis of the average monthly quotation of the market at St. Louis.

Zinc—This market was very dull. Some small transactions were reported from day to day at about 7¾c., St. Louis, but on Dec. 11 the market exhibited a weaker tone.

The zinc requirements of the U. S. Government and of the foreign governments associated with this country in the war are being taken care of promptly. It is understood that the purchases for the Allies of the lower grades are being made in the open market at going prices.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull, No. 1 ingots being offered at 36c. per lb., New York. Aluminum-sheet demand is good, however, the output of one Middle West mill being sold up to July, 1918.

Antimony—This metal was a little weaker and we quote spot at 15@15½c., while futures are quoted at 14c., c.i.f., in bond. The market was dull, but there were unsettling rumors. Some Governmental action is anticipated.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.50 @1.75 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Some small sales of spot were reported at $117½@120, but the major market remained at $115, which price is quoted for quicksilver to arrive. The market has a strong undertone. San Francisco reports, by telegraph, $112.50, steady.

Gold, Silver and Platinum

Silver — This metal remains quiet and steady, with moderate shipments to London. Business is being conducted with San Francisco for Far Eastern export. Nothing has yet been positively decided in the matter of the purchase by the United States and British governments of all the available silver supplies of the country for redistribution where most needed, coinage requirements being the most pressing need.

Mexican dollars at New York: Dec. 6, 65¾c.; 7, 66¼c.; 8, 66¼c.; 10, 66c.; 11, 66c.; 12, 66c.

Platinum—Unchanged at $103@105, with the market fairly active.

Palladium—Very strong. We quote $127.50@130.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 8—Blende, basis 60% Zn, $62 base for premium ore down to $57 base for second grade. Lead ore, basis 80% Pb, $75 to $70 per ton. Shipments reported for the week are 3209 tons of zinc ore, 42 tons of lead ore, and 574 tons of sulphur ore. For the year to date the figures are: 138,028 tons of zinc ore, 6689 tons of lead ore, and 27,005 tons of sulphur ore. Shipped during the week to separating plants, 3862 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore, 48% grade, is firm at $1.20 per unit.

Molybdenite—Demand was very strong and business was done at $2.25@2.30 per lb. of molybdenum sulphide, basis 90%.

Pyrites—Spanish lump quoted at 15@15½c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports. However, despite these so-called fixed rate, one importer recently had to pay 42s. 6d. for a charter to Charleston, S. C.

A Georgia producer reports the sale of 300 to 500 tons of 47-50% concentrates at 30c. per unit delivered at customer's works, the freight rate from the mine shipping point being $1.12 per long ton; Georgia lump, 43 to 45% S, was sold at about 35c. per unit, cinders reserved.

Tungsten Ore—Moderate business was reported at somewhat easier prices. Business in the highest grade of ore was reported done at $22@24 per unit.

Iron Trade Review

NEW YORK—Dec. 12

With no authority which can give assurance of stable prices, consumers are cautious in buying. This is particularly true, says "Iron Age," in lines of product in which Government wants are not dominating. As to plates, shapes, bars and forging steel the average buyer appreciates that contract deliveries are entirely subject to war priorities.

Specifications for Government steel are going to the mills faster than had been

counted on, and some classes of mills are more fully operated on war account than seemed likely two months ago. Yet there are gaps due to lack of team work. For example, Canadian plants having contracts for American shells complain of the slowness with which orders for the steel are sent out from Washington to the makers here.

The pig-iron market is working steadily toward a condition in which consumers without war orders will find it wellnigh impossible to secure iron. Philadelphia continues to lead in the volume of new buying. About 60,000 tons was bought there in the week, 30,000 tons being basic for delivery over the first half of 1918.

PITTSBURGH—Dec. 11

The announcement that at yesterday's meeting at Washington between the War Industries Board and the steel producers the matter of prices was mentioned only very incidentally, the discussion being chiefly as to deliveries and methods of distributing Government orders, is a trifle puzzling, because the official announcement that such a meeting was to be held stated specifically that the meeting was for the purpose of considering prices, seeing that they had all been set with the proviso that they could be revised Jan. 1 or later. The conclusion would be that Washington has no serious thought at this time of urging any revision downward were it not that it is announced that there is to be a meeting between the steel producers and the Federal Trade Commission next Friday. Producers as a class would deplore any such change in authority when the arrangement reached with the War Industries Board has been working so smoothly. The opening up of the subject at all is deprecated as having an unsettling tendency upon business and it is stated that business has suffered a distinct decrease in the last few days, owing to the public announcement that the matter of prices was to be considered this week. While producers point out that their costs have increased since the original price agreement, announced Sept. 24, buyers interpret any talk of price revision as meaning a revision, downward and not upward.

The decrease of 112,569 tons in November in the Steel Corporation's unfilled obligations, against decreases during the preceding five months running at more than half a million tons a month, represents in part the large contracting for tin plates and sheets for the first half of next year, following the setting of Government prices on Nov. 5, in part an increase in Government orders and in part a decrease in shipments. The decrease in shipments has been exaggerated in some quarters. The best evidence indicates that shipments were about 1500 tons a day less in November than in October, representing about 3% less capacity employed.

The distinction between strictly war steel and commercial steel is being wiped out. The direct war steel, in the form of shell steel, ship steel and other forms required directly by the military forces, for the Government and its Allies, may involve 35 or 40% of the steel-producing capacity in the next few months, but the major portion of the remaining steel is now regarded as war steel in substance, as it is being used in industries indirectly aiding in the prosecution of war. Two instances may be cited, the steel used in oil production and the steel passing to the railroads. Many mills estimate, from this viewpoint, that from 75 to 100% of their output is now going to help prosecute the war. The amount of steel going into luxuries, or what are now called "unessentials" is relatively small.

Pig Iron—Coke receipts at blast furnaces increased somewhat as last week progressed and some banked furnaces were able to resume, but a severe cold snap developed, last Saturday night, and the coke movement was retarded again, with the result that yesterday and today some additional furnaces were banked. While the situation is bad it is not as bad as would have been expected for the circumstances, as the whole trade has been dreading what the first real winter weather would do to the railroads. During the fortnight preceding the congestion at railroad yards and sidings had been in considerable measure relieved through the orders issued by the General Operating Committee, conducting the pool of railroad facilities east of Chicago. There are scarcely any market transactions in pig iron, previous engagements of the merchant furnaces taking up all their output as lately reduced by coke shortage. Government limits are strictly observed when there are sales: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50, f.o.b. furnaces, the freight from valleys to Pittsburgh being 95c.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 11
Alaska Gold M	2⅛
Alaska Juneau	2⅛
Am.Sm.& Ref.,com.	70
Am. Sm. & Ref., pf.	100⅞
Am. Sm. Sec., pf., A	92½
Am. Sm. Sec., pf. B	‡96
Am. Zinc	12⅛
Am. Zinc, pf	42
Anaconda	55
Batopilas Min	1
Bethlehem Steel	72
Bethlehem Steel, pf.	80
Butte & Superior	16⅜
Cerro de Pasco	28⅛
Chile Cop	13¼
Chino	41
Colo.Fuel & Iron	32½
Crucible Steel	50
Dome Mines	6⅛
Federal M. & S.	9
Federal M. & S., pf.	30
Great Nor., ore ctf.	24⅛
Greene Cananea	36
Gulf States Steel	84
Homestake	‡90
Inspiration Con	41
International Nickel	25
Kennecott	29⅛
Lackawanna Steel	77⅞
Miami Copper	26⅛
Nat'l Lead, com.	42⅛
National Lead, pf.	98⅛
Nev. Consol	18
Ontario Min	4½
Quicksilver	.50
Quic silver, pf	2
Ray Con	21⅛
Republic I.&S.,com.	72⅛
Republic I. & S., pf.	93½
Sloss-Sheffield	35
Tennessee C. & C	12⅛
U. S. Steel, com	85⅛
U. S. Steel, pf	105⅛
Utah Copper	77
Va. Iron C. & C	50

N. Y. CURB†	Dec. 11
Big Ledge	1⅛
Butte & N. Y	.75
Butte C. & Z	7
Butte Detroit	1/16
Caledonia	.45
Calumet & Jerome	1⅛
Can. Cop. Corpn	1⅛
Carlisle	3
Cashboy	.04½
Con. Ariz. Sm	1⅛
Con. Coppermines	7
Con. Nev.-Utah	.03⅛
Emma Con	1/16
First Nat. Cop	1⅛
Goldfield Con	⅛
Goldfield Merger	.04
Greenmonster	1/16
Hecla Min	4 13/16
Howe Sound	3⅛
Jerome Verde	1/16
Kerr Lake	5⅛
Louisiana	.05
Magma	39
Majestic	.30
McKinley-Dar-Sa	.58
Milford	1⅛
Mohican	1/16
Mother Lode	.29
N. Y. & Hond	11
Nipissing Mines	8⅛
Nixon Nevada	1⅛
Ohio Cop	⅛
Ray Hercules	3
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead	15½
Standard S. L	1/16
Stewart	.25
Success	.13
Tonopah	4⅛
Tonopah Ex	1
Tribullion	⅛
Troy Arizona	.17
United Cop	.50
United Verde Ext	32½
United Zinc	1⅛
Utica Mines	.08
Yukon Gold	1⅛

SAN FRAN.*	Dec. 11
Alta	.03
Andes	.08
Best & Belcher	.02
Bullion	.01
Caledonia	.06
Challenge Con	.03
Confidence	.06
Con. Virginia	.17
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt	.07
Mexican	.08
Occidental	.60
Ophir	.08
Overman	.04
Savage	.01
Sierra Nevada	.17
Union Con	1.00
Utah Con	.01
Belmont	3.50
Jim Butler	.75
MacNamara	.17
Midway	.05
Mont.-Tonopah	.07
North Star	.04
Rescue Eula	.08
West End Con	.69
Atlanta	.08
Booth	.03
Comb. Frac	‡.03
D'field Daisy	‡.02
Florence	.08
Jumbo Extension	.13
Kewanas	.03
Nevada Hills	.05
Nevada Packard	‡.15
Round Mountain	.20
Silver Pick	.05
White Caps	.04
Big Jim	‡.75
United Eastern	3.65

BOSTON EXCH.*	Dec. 11
Adventure	‡1
Ahmeek	78½
Algomah	‡.25
Allouez	51
Ariz. Com., ctfs	10½
Arnold	‡.25
Bonanza	‡.21
Butte-Balaklava	‡.56
Calumet & Ariz	62
Calumet & Hecla	418
Centennial	14
Copper Range	40½
Daly West	‡2
Davis-Daly	4½
East Butte	9
Franklin	4½
Granby	‡65
Hancock	8
Hedley	‡15½
Helvetia	‡.25
Indiana	‡1
Isle Royale	‡23
Keweenaw	‡1
Lake	5½
La Salle	2
Mason Valley	4⅛
Mass	6⅛
Mayflower	1½
Michigan	‡1
Mohawk	57½
New Arcadian	1⅛
New Idria	‡13½
North Butte	12½
North Lake	‡.50
Ojibway	‡1⅛
Old Dominion	37
Osceola	56½
Quincy	65
St. Mary's M. L	48
Santa Fe	74
Seneca	‡6½
Shannon	5½
Shattuck-Ariz	‡18
So. Lake	‡1½
So. Utah	‡.14
Superior	‡5
Superior & Bost	2⅛
Trinity	3⅛
Tuolumne	1⅛
U. S. Smelting	44
U. S. Smelt'g, pf.	45
Utah Apex	2 1/16
Utah Con	10⅛
Utah Metal	2⅛
Victoria	‡3
Winona	‡1
Wolverine	‡32
Wyandot	‡.50

BOSTON CURB*	Dec. 11
Alaska Mines Corp.	.25
Bingham Mines	9⅛
Boston Ely	.60
Boston & Mont	.45
Butte & Lon'n Dev	.13
Calaveras	1
Calumet-Corbin	‡.01
Chief Con	1½
Cortez	.10
Crown Reserve	.20
Crystal Cop	.50
Eagle & Blue Bell	2
Gila Copper	17⅛
Houghton Copper	.60
Intermountain	.80
Iron Cap, Com	14½
Iron Cap Cop., pf.	‡14½
Mexican Metals	.27
Mines of America	1½
Mojave Tungsten	.25
Nat. Zinc & Lead	.28
Nevada-Douglas	1⅛
New Baltic	.75
New Cornelia	14
Oneco	.25
Pacific Mines	‡.35
Rex Cons	.09

SALT LAKE*	Dec. 10
Bannack	.26
Big Four	‡.01
Cardiff	2.00
Colorado Mining	.10
Daly	1.00
Daly-Judge	6.00
Empire Copper	1.17
Gold Chain	.11
Grand Central	.58
Iron Blossom	.65
Lower Mammoth	‡.03
May Day	‡.03
Moscow	.11
Prince Con	.54
Rico Wellington	.18
Silver-King Coal'n	2.50
Silver King Con	2.60
Sioux Con	.03
So. Hecla	.76
Tintic Standard	1.45
Uncle Sam	.02
Wilbert	‡.15
Yankee	‡.02

TORONTO*	Dec. 10
Adanac	.12
Bailey	.05
Beaver Con	.29
Chambers Ferland	.09
Conlagas	2.90
Hargraves	.08
La Rose	.37
Peterson Lake	.12
Temiskaming	.26
Wettlaufer-Lor	.05
Davidson	.30
Dome Exten	.09
Dome Lake	.13
Hollinger	4.90
McIntyre	1.33
Newray	.35
Porcu. Crown	.22
Teck-Hughes	.25
Vipond	.19
West Dome	‡.13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 11
Cresson Con	4.87½
Doctor Jack Pot	.03½
Elkton Con	.03¾
El Paso	.15
Gold Sovereign	.02½
Golden Cycle	1.63
Granite	.42
Isabella	.09½
Mary McKinney	.05½
Portland	1.15
United Gold M	.14
Vindicator	.34½

LONDON	Nov. 21
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp	3 19 4½
Cam & Motor	0 11 6
Camp Bird	0 7 6
El Oro	0 9 0
Esperanza	0 8 0
Mexican Mines	5 12 6
Min. Corp. Can.	0 16 9
Nechi, pfd	0 10 0
Oroville	0 19 3
Santa Gert'dis.	0 14 0
Tomboy	1 1 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan	48.855	56.775	75.630	22.731	26.960	36.682
Feb	48.477	56.755	77.585	22.753	26.975	37.742
Mar	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug	47.163	66.083	85.407	22.780	31.498	43.418
Sept	48.680	68.515	100.740	23.591	32.584	50.920
Oct	49.385	67.855	87.332	23.925	32.361	44.324
Nov	51.714	71.604	85.891	25.094	34.192	43.584
Dec	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	25.380	110.283	122.391	126.304	137.000
Sept	26.855	25.073	113.905	117.500	134.071	135.250
Oct	27.193	23.500	122.750	110.000	142.523	125.000
Nov	30.625	23.500	134.659	110.000	155.432	125.000
Dec	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	243.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct	9.829	7.983	9.659	7.813	54.159	54.000
Nov	11.592	7.847	11.422	7.672	56.023	54.000
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.66	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.45	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	37.25	28.18	33.95	26.55	33.95
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.